



VIC: The VCR-20 Is an ultra low power (CMOS) 20K RAM plug-in cartridge, retailed at £54.00 in kit form and £59.00 in ready-built. We can also supply with only 4K of RAM, ready-built et £20.00 end as many extre 2K RAM chips (HM6116) as you require et £5.00 each. No PSU required, beige plastic cover.

The VCS is a cartridge simulator and combines the adventage of the motherboard with two slots end the 8K battery beck-up CMDS RAM. This emulates cartridges and adds 8K to RAM. Available end of April in kit form £39.00 and ready-built £45.00.

ATOM: The DUC-1 is the latest 64K mamory add-on designed for the Atom, combining very low power consumption (200mA at +5V) and RAM power. This runs, loads and saves 64K basic programs Kit form £64,00 ready-built £70.00. No PSU required.

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NEXT MONTH5 Find out about our June World Con



Fantasy worlds

Computers can make very disciplized opponents but in names of bluff and cunning there is gothing like trying to out think a fellow humon

COMPUTER MODERATED GAMES (Prope 20) give you the hest of both worlds. leaving the computer to run through the calculations and ludge the outcome of conflicts while humans provide the devious opponents.

Find out how to eater these increosingly popular laatasy worlds — and what's in store for those

who do. Also a chance to take part in a game for free. FINSTEIN A. GO. GO. More science fiction Ideas from author David Lanaford - complete with a games

program listing. (Page 28)

COMPETITION
A chance tot 15 teaders to enjoy a
tree 18 months worth of play to

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Fight your way down to the inner most core of Mans, adventure on an aften spaceship and lackie the Group House!

A video game from conception to shop display We had out how cox

ARCADE ACTION30 Tips on playing Qix World Cup teres and raque plaball

Prowi around in the Catacombe Watch out for deadly Falcons

Listings

The world of property speculation comes to your Sharp MZ-80K for two to five players. For bankers and bankmats.

EARTH PORT II

A marvellous docking game on the Tandy TRS-80. Find your way to the orbiting space station and see if you PUCEMAN

The gbosts are in the maze and after your blood. Eat your way into our version of the papular Puckman game on a Pet.

DOUBLE CANNON Turn your Atan iato a shooting galiery and test your morksmanship.

Asteroid on the Apple. Can you take your ship through the dreaded meteor belt.

space attack game.

SINCLAIR SELECTION Four games for your ZK81 in IK Avoid the Projectile, Skr, Grand Prix, Earth v. Flying Saucers, for you to key in to your unexpanded Sinclair.

It's you against the pasty little creatures which always find their way into your bath. But beware! Atom spiders are dangerous creatures and quite capable of defending themselves.

MINOTAUR A VIC-20 maze game — all the way from Swedea. Find



your way out of the labyrinth.

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June will find normally mildmannered men vehemently pushing forward halfbelieved theories

as indisputable facts. Gesturing wildly with beer-glasses and shouting down conflicting opinions with a bigotry which belies 50,000 years of civilisation.

Yes, you guessed, the World Cup is with us again and love it or adore it—it's difficult to close your eyes to it.

Your eyes to it.
Already the orguments rage
with the Hoddle Walks on Water
school, bentling against the He
Couldn't Kick His Way Out of a
Paper Bag theorists. Northern
Ireland is dogged with the Morin O'Niell question and Scotland — which has seen it all
twice before in the last eight
years — is gearing itself up for
he lordan or Gray debate.

ft's certainly a hot topic in Argentina and probably causing quite a furce in El Salvadore. But il the facts don't finally support your views then Computer & Video Games cam help you take the matter into you own hands.

ff you feel England would have qualified from their group if only Greenwood had followed your advice for the team against France then you will have the opportunity to prove it next month when we publish our World Cup Manager game.

You can choose to manage any of the 24 sides, pick your team, play your matches and find out how you've lared. Send out your scouts to watch the opposition. brief your team on tactics, discover the danger men in the opposition and make arrangements to mark them.

Winning with Brazil or West Germony is a hard enough task but anyone who can do it with El Salvador will really have proved their management potential. We think it's a winner, see what you think next month.

● Everyone will be a winner with our World Cup competition. The Silica Shop is putting up the Atari T.V. Games Centre and football cartridge for the first prize but there are also consolonion prizes and everyone who enters will receive a £3 voucher to spend at the Silica shop.

Find out how to enter and test your football judgement in our lune issue.





If the spirit of Adventure is lurking in your veins, you'll find plenty of ideas in our June issue.

We have four very different adventures featuring next month. From outer space thrills in the Star Wars mould with Dog Star Adventure down to the depths of the earth for a very different kind of challenge in the hunt for Trolls Gold.

Or you could Save the Princess in another short adventure game for Atom owners.

When the BBC lends its name to a product it has to be special and the microcomputer that bears its name falls into that category.

If you own one already, have one on order, or just have a healthy interest in the machine, you'll want to read our special section on this highly rated microcomputer — including three of the first games created for it.

Commodore's ViC-20 is now in the high streets and selling well. The company is supporting it with some high quality games cartridges and a growing image of peripherals. A complete rundown on this popular micro takes place in next month's Hardcore section.



The response to our first issue's free cover puzzle caught us on the hop. This time we think we're ready

lor you — and we've also set you programmer/puzzlers a slightly more challenging task

There's another free puzzle, from the people at Pentangle, going on our June front cover and although you won't need a computer to solve it—we hope you'll use one to enter our second competition. Even if you don't win you should emerge a better problem solve for trying.

The Beat the Bug puzzle will make Computer & Yidoo Games stand out even more on you local newsagent's shelves But why not make sure of your copy by subscribing now.

I emclore a chequie PO 5 s. RD (EEI) increases for the abelier name. Compute A s backerine. Foretram Foretram, Peterbassiagh PE AND.

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NOW - The second part of Arrow of Death plus a new Adventure! Escape from Pulsar 7 is the first space Mysterious Adventure. Arrow of Death Part 1, elready said to be one of the best 16K Advantures written, is surpassed by the Part 2 adition. Arrow 2 carries on from Arrow 1 but is self-sufficient. In Pulsar 7 you will be delivering Redennium one to an outer galaxy when you pick up an interesting creature for the intergalactic zoo on your home planet, but what happens when the ore and the animal inadvertently come together?

neu/!

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THE LOST KING . . .

Dear Sir. I own a chess-playing computer and always read your page on this game

In the April iesue, I was delighted to find an opportunity to test my own machine by inputting the problems which Max Bramer had illustrated. which illustrates a problem solved by the Sci Sys Mark V. is missing a black kind - no wonder it delied

D. loseohs Oban

Editor's reply: The diagram is not only minus a black king. It is also the wrong way up. A correct version still prove a real test of ony chess problem solvers or their machines!

T 100 1 888 直立公众 5 4 直動為 hadefah

LANGUAGE PROBLEM.

Dear Sir, Would you please answer o shortly be getting a Vic-20 ordered from the United States. What I would produced for British stan dord Vic-20's will run on U.S standard Vic-20's Is Liverpool

the Basic the same?

Basic is not the same the Vic would have "COLOR" where the British Vic would have "COLOUR" If this command is different will the tape still load so it can be listed and changes

I hope I can use British many excellent agme progthe Vic-20.

Michael B. McAllister RAF Lokenheath Suffelk

Editor's reply: You should hove no problems Michoel as all Vic-20s are imported from the U.S. anyway so there's no such thing as a British standard version. The Basic is standard so you should be able to use British produced games tapes.

WAITING TO INVADE

Dear Sir

am very pleased to say that I have thoroughly enjoyed all the jesues of Computer and Video Games since the hist one issued in

Every month I look for raview or on advertisement for Space Inveders for the time until your tatest jesue - Morch - in which on page 83 1 saw an advertisement for it. I am not too sure whether

I should buy.

So could you please help in search of VIC Invaders by providing some informa-

K. S. Arom

dering about most of all is dore cartridge Avenger Is

the colour command. If the one of the best computer- to only see one game, where ised Space Invader games as the ZX 81 has had six you'll find Mr. Arom. It is games, Apple computer one available from their dealers est £17 35 + VAT

GRAPHIC DISPLAY

Deor Sir. I cm writing in the hope of adding enlightenment to all

In reply to DK'tronics advertisement — page 63 of received their 4K graphics ROM. It is a very neg Eprom based circuit that lits under the ZX-81 keyboard.

To date I have converted unut Cosmax and Cosmos Landing programs and, by obtained some hilarious wings, arms and legs.

While on the subsect of my congratulations to the co-methors on an excellent program. More of the same quality please - vio a ZX-81 user perhaps? R N. Legthers

Bassingboum Herts

MORE FOR THE VIC Dear Sir.

I am requesting more Vic-20 programs The Vic-20 compuler is becoming more and more popular and may dare eay? - taking over the ZX-81/ZX-80. 1 know many

- 1. unfortunately have not - and often have access to the use of a Vic-20 would like to see more games for it using all its qualities sound, colour and good

Having all but one issue I The command I am won- Editor's reply: The Commo- have played Pot Shot which the routine on page 89 of

and in each issue of your please have more games

Bedfardshure

Editor's reply: We will be running more Vtc-20 programs Citye, to fact you'll find one in this leave and we promise not to ignore your favourite machine.

DODGEM

Dear Sir. Modifications to allow your Dodgems program to run without floating point

A) 11125 remove 11250: remove COLOUR 1:

B) 20. 40. 60, 80; ln each "S = S + SGN (T-S)."

to GOS1; S-S+K. and odd 30000 K -T -S: IFK -0

30010 IFK # K =1;R C) During debugging

Tom Boyd Holmbury St. Mary.

Dorking. P.S. D) 11125 should be

otherwise high etandard of lohn Dyson replies:

Thank you lor your modifications for running Dodgems on a machine without the floating point ROM. It should also be possible for you to run the program in colour by using I enjoyed but am disgusted Atomic Theory and Practice.



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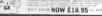
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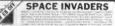
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THE AFFORDABLE ANSWE



e broci







MAILBAG

SINCLAIR SELECTION

Dear Sir.
I have a Sinclam 7X-81
Without o 15K RAM pack,
and have bough the last
few editions of your
generally excellent
magazine. My only
comploint is the krick of 1K
games that you lixue
recently orinted

recontly printed

I think the beet ideo you can adopt ie to print both a

IK and 16K prog am, pleasing both IK und 16K
Sinclari owners I am pretty sure that there are many other fruet, tied IK owners who would like to see thite idea being corried

Patrick Morrow Madeley Shroothire

Editor's reply: We feature four Sincloir 1K games in this lesus Patrick and we hope you'll enjoy alaying them. And yes, thore will be a 16K game coming up in the near future.

SOUND

Deer Sir, I read in your Sounds column of the December I issue of Computer & Video Gemes that: 'It is always possible to connect the computer to your he it could lary inputs and there by

obtom complified sound.

I have o Tandy "RS-80

Level II 16K microcomputer, and only recently, quite by occident, discovering that it had a sound facility.

At the Tundy simp I was advised to buy a small amplifier with a "diameter loudepeather. They said that a direct connection from the tape outlet to my 15 ft would be dangerous, as upite outputs from the h-ft could dimense the computer chips, when I contacted a french who is very knowledgeable in these fields.

Yet at another shop o salesman, when I was discuesing the purchase of a non-U.H.F. V.D.U. sold that he could incorporate the sound locility in it converted U.H.F. television by making one-wire connection across-

the DIN-plug videa output on the computer.

I om now quite bestused. I would like to purchose such a converted U.H.F. to televasion, o el would then bere the advertisege of portability together on o portability together on the portability together of the portability together on the portability together of the portability together of the portability of the portability together of the portability to the portability of the portability o

Ruddersheld.
David Annai replies:
It le diwaye wise to consider
any domage that might be
done to a computer by
connecting it to mything
else. The ease the do d
avoiding trouble is to
separate the computer
completely from the

following circuit.
Thie con be done by ueing opto-teolorier. These are small light-prior chipse controllage of light emitting diode and o light emitting diode and o light emitting diode and o light emitting transmitted by light and no physical connection states between the two circuits. This me that is light and not provided the control of the contr

Another way to to use some form of butter circuit such as a Derlington driver chip like the 207-108 from Rodiosparse. Unfortunately there ore seven drivers an one chip and eight lines out from the oversop computer but By interspersing an extra chip between the world. All that could happen would be lie need to replace this end not one of those in the computer treats!

A much easier way to protect the computer is to eimply use a series resistor. Any computer line configured on an output should ALWAYS have a series resistor placed immediately in the whre next to the computer port before any external circuit connected to it.

Restatore of 1K are usually adequate, but in the coee described above, one of 100K to better and will not affect the output overmuch. Place this assets with the eignal

wire from the casestte port.
or DIN socket, and no borm
should come to the

computer. Note, however, that some hazard can arise when connecting T.V. sets direct to the computer other than vio the usual UHF aerial socket. Mony such sete have a "floating chosels" which te not earthed. To sorth it through the computer digital ground or by toking a line direct to the earth pin of your maine le highly dangerous, however, o competent T.V. engineer should be well aware of this point.

READER'S APPEAL

Deor Sir, You have a great magazine but I fise! I must complain about the programs sent in by some roaders

lown o ZX-81 and andeatly keyed in the program for Reveret. feathered in your Morch edition. This i did despite there seeming to be an error in the machine code stotement, where is the 3Q°s in line 5? Why is there such appthy omang the ZX-81 owners.

offer all I have managed to key in and successfully run programs for other computers, after changing them to ZX-81 boelc. Commativitiess on an

otherwise excellent mogazine P. J. Jinks, Chessington. Surrey.

COSMOS FAULT Degr Str.

I have enjoyed playing your Cosmoe Landing program very much and was able to correct the mistakes pointed out to your Morch issue without any great difficulty. I am surprised bowever to discover that Mr Wiel has not also spotted what I would consider as a major routtne iault. The variable l assigned in lines 130-140 has no effect whatsoever on the descent rate. The fault lies in line 320 and I found replactng this with LET S=5+1/l very effective in solving the problem. I om not were that this is the original line intended, but I feel that the fault should be made known to your other readers os it improves on otherwise hrillioni gome S. W. Stewart.

Westway Gardens
Realions

DEFENDER ON APPLE

Dear Sir. I read in the Imnumy issue of Computer and Video Games the articles on the orcade game Defender, which interested me greatly, as I play the gome myself. As I have access to on Apple 11 computer, I was wondering whether you might know il n version is being brought out on a disc or cassotte in the foreseeable future, or even if a similar game is available. I hope you can help me with my query. J. S. Heppell, ingo testone Essex

Editor's reply: There is an Apple II ventor of Delender on sole in the UK. It is an American written game by Striue Software and you can obtain a copy of it from most Apple software declers, including SBD Software of Richmond. The game is called Googo and according to the latest purce list it costs E24.85

AMERICAN DRFAM

Dear Str.
We are considering gaing to
Americo for our holidoys
this year. Is it possible that
if we buy an Atart 800 computer — which costs a lot
less in USA — we can use it
in Britain with our TV, sys-

Also se there duty payable of Custome, if we declare the purchose of such a computer—or or ore they exempt? Adriam Morris
Cardiff

Editor's reply: Sorry Adrian, the American Atori 800 is not compatible with the British T.V. system so your American dream will not be coming true.



MAILBAG



FROM THE BATTLEZONE

Dear Sir.
To my mind, people are attracted to areade games subconsciously, for they often get aut far more than they put into these

tory plus in the control of the cont

A kind man let me mend can here here a Kendemen let me mend late program plus four late program plus four late program plus four support devices. She certainly puts out more than you put in. Al a guess the software come out of the bockdoor from NASA. Boeung and Lockhead.

Thoughl your readers might be interested. Jonathan Pope Chesterion Road, Combridge.

JUMBLED ADVENTURE

Deer Str.
I have an Altan 400 computer with a microtes 23K card in it. Please could you help me with a problem I have codenline specially in the same than 1 have been I run the games they are all night, but sometimes when I pract he roturn key, the purchase of the pur

The only way oul of this is lo turn the power off and to start again. I have also tried the games on an Alari 800 and the same thing hoppens

I would just like to congrolulate you on the marvelous reading that your magazine ofters. Mr J Harrison,

Milliroda,
Southampton.
Southampton.
Editar's reply: Tm afraid
that you either have a leulty
casset to containing the
game, or a faulty campuler.
I suggest you take your
campuler to your sucoller

and get him to give II an averhaul to see if anything is wrang. Unfortunately, the Microtec 32K card is not one which either Atari ar

Ingersoll supports for use with the Atari.

If you have not already tried returning the games to the supplier in case they are at fault, it would be a road

TUNE IN TO

Dear Str.

I have ordered a Model B.

BBC microcomputer which
is due in March. Piecus
could you infarm me
whether a BBC Users Club
is planned to be farmed in
like near tuture?
Jonnthan Freeman
Funham
Coventry
Editor's reply: Here are a

cauple of addresses you

may find useful Jemathon.
The ZX-80'81, Acorn Atom
and B.B.C. Micro-user Club
can he contacted by
writing to Tim Hartnell,
44 45 Earls Caurt Road,
Londan WB. This cluh
produces a magazine
called interface which
includes programs for the

B.B.C. micro, The Beebug User Group can be found at 35 St Julians Road, SI Albans, Hertfardshire and D. E. Graham is the person to

COUNTING ON COMMODORE Dear Str.

Dear Sir, As mast peopls know, the Commodore's Pet computer uses a cassette recorder for storing programs on tape. This is very inconvenient, it you have a long program

This is a drawbock we have lo put up with, hal another problem, which crops up when saving programs an tapes, is now ta find programs in the middle at a tape.

minduce in a uppe.

This problem can be avercame by using a large counter, so it is possible to record the number the program is at. Will we be likely to be seeing Pet computers with tape counters, in the near between

inture?
Andrew Zucker,
Finchiey,
London.
Editor's reply: Your idea for
a lape counter is a good
out, hul Cammodore
claims it has besten you ia

citims: I has besten you to it. I don't know what make of cossette recorder you have but the slandard Commadare composible one is the C2N which already has a counter.

SOUND AND VISION ...

Dear Sir.

Well, I'm lost far words! All
I can say is that yours is
one fantastic magazine.

But also even with all your
excellent advice I am still

unable to create my dream game which, when finished I might let you see. To tell the truth I haven't started yet hul with your help, who knows?

your help, who knows?
I can presently using an
Apple II. I have searched
the manuals high and low
in order to find some good
sound effects. All I have
achieved so far is a loop
around a line like
PEEK (-1838) - PEEK

(-16336) + PEEK (-16336), Are there any other ways of getting sound from the Apple because this sounds horrible. Not exactly your ideal laser our sound.

l am also experisnand.

I am also experisnand
problems in High Res
Graphics. I am presently
using a shape from a
shape table with the

DRAW 1 AT 19, 10 This works fine bul I

would like to know how lo make the shape move hy pressing a key on he keyhaard and for that shape to continus moving until that key is released. Another prohlem I have is haw to make the aforementoned shape explode or disappeor when

touched by another shape e.g. a missile. Is there any way your dedicated readers could help me and I'm sure many

help me and I'm sure many athers like me? Please, please write in because I'm really desperate
I'm sure many readers
with Apple's without

in sure many readers with Apple's wilhout poddles would like to know how to convert the Doglight hy Mark Pelczorsk in the February issue in lo a keyhoard operated version.

Poul Camey Exeter, Devon



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All those now in a state of confusion should turn straightcway to page 70 for entightenment. It you have circady digested our double page spread on computer moderated gaming then you will be ready to cony

Flying Buffalo's U.K. ogent, Chris Harvey is oftering 15 Computer & Video Games leaders the chance to take part in a special tree game of Starweb.

tree game of Starweb.

It's special because the company is promising a fast turnaround so you'll be able to see
the results of your orders without
having to want the usual four

The computer is running off the first few turns of the game, so that you begin the game already involved in the action. We will also be following your fortunes in the magazine with a regular column devoted to the deals, battles, hopes and fears of the players.

If you would like to join in, write, telling us which of the six character types you would like to play: Berserker, Apostle, Pirate, Artriact Collector, Empire Builder or Merchant.

Choose a species name for your race which tits the character type you have decided on.

And the first 15 unequative names we receive will be given a place in the game. We olso need your name, oddees and telephone number but most importantly we need 15 people who will make the decidlines for orders, not lose heart if there system is invaded by a fleet of Berserkers and be willing to write the occasional piece about the game for inclusion in the magrams. So be quick off the mark with your letter.

We need your games

Calling aspiring gomes writers:

ff you think your games deserve a wide audionce then send them in to us with instructions, a list of variables, and other helpful information to aid our readers in the understanding of the game.

No matter what machine you want to write on, we'll try and get around to publishing your game. A printout is what we will eventually need but we can make do with a tape — which also helps us try the game out — and get the game printed from

Our thanks to all those who have sent games in to us so far but there are some mochines we would like to continue to support and we are running short of good games for.

Remember we pay £10 for each listing published and there's also a chance of winning a trip to Paris if your game is voted the best of the year.



Confessions of a Bug

There are limes when we Bugs surplise even ourselves. The February edition offered the Tendy TRS-00 game of Grand Plix which generated innumerable phone calls from readers who claimed various assorted geniums in the program — but we never louched if Homes!

The most popular (heory expounded was)hat disc based instructions made it impossible to run with a cassette But after thorough testing (a Bugs curse on John Gibbs of Dover) it has been proved to everyone's satistaction that the game works perfectly well on both disc and cassette.

The problems seem to telate to the data statements and making see you distinguish between a "B" and an "B" in these. Also check the letters "D and "O" in the program. A program which includes a line to check the data entry is available to mo Computer & Video Games for anyone still having problems with this game.

The ZX81 Poker game in our April issue caused plenty of phone calls from observant programmers who spotted an IF statement in line 3530 with no THEN attached.

The fine is correct as far as it goes but continues

=J(4)ANDJ(2)+2=J(3)+1 THEN LET T4=1234 This game does in fact work without

This game does in tack work without the missing line until you get three of a kind up — and so slipped through the rigorous testing the editor put if through

The Moon Lander caused a tew problems as a rogue symbol appeared in the printout in line 360. It was a colon — as most ol you seemed to guess. The line should read: 36091=91125 N.

yours Mal

IBRAINWARE ANSWERS

The answer to our April Mind Routines problem is 1789 bags divided as follows: first man 589, second man 477, third man 393 and fourth man 330.

The correct solution to last month's Nevera Crossword is printed right and the winners' names will be published in next month's issue.

For more puzzles to tax your mind turn to page 81 for this month's Mind Routine and Nevera Crossword.



BUG-B-

B.B.C. MICRO **ZX81**

ATOM

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NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS N

SCRAMBLING AROUND THE ANCIENT CONFLICTS TRIUMPH OF ROME THE RED PLANET

In the third place the sheft

The game becomes progres-

sively main difficult in the follow-

ing three phases. The game ends

when you successfully land your

ship on the pod at the bottom of

on the Aucade name Scramble --

is a creation from Atan which

runs on their 405 or 800

machines Retail butca is \$29.95

and it's available from Aten dis-

The Caverns of Mers - besed

narrows even more and you have

to By your ship Blound berners

and you are dead

the sheft

CAVERNS OF MARS

On a trip into space you discover

a massive holo on Mars The grant cavity is the result of meteor crashing onto the plenet

You decide to explore the cavern and control a spaceship on a journey into the depths of the red planst

The cuvern spon nerrows as you get underground and you have to steer clear of the regged sides of the shaft while at the seme time bombing a number of fuel dumps on your way down Is the game starting to sound

If you get through without

Meanwhile back in the second

century SC the mighty Roman depicting Greece and the sizes legions are advencing on the Seleucid Kingdom.

The Salaucid Kingdom was a Graek Empire stratching from north-east Guence to the borders which appars randomly Hit one at India - and the prize which the two nations were lighting for was the domination of Grance and the crise on the western

coast of Asia Minor In this same you raise this ancient bettle for power Improvements have been made to the propram logic to make the simulation of waifers more reelectic and decisive. A typical game well take about three hours

to complete and a facility for

taping a partially fireshad game is

paid The program elso covers rsaval oncounters land battles and segges - and takes account of the various capebilities of diflerent tioop types in varying cilcumate aces

TRS-80 in 16K and comes from Molimers of Bexhill-on-See It costs FI3 51

Three maps are provided of Asia Minor on the Asge en See The forces available to each player anclude infentry cavelry alaphants, stuga artillary weiship and transport vassels During the game texas have to be raised troops recruited and

Triumph of Rome runs on a



SPACE FIGHTER

Aliens are out to set you end your chances of survival are skm. as you fly a space crusser over undulating torrain dodging onemy file coming from all direc-

There are five variaties of aliens out to get you and you must evoid being shot down by these nesty characters

Some move straight towards you, some movo down tho screen and some diagonally

Your defence is a leser cannon.

ficult end you teel your ship is in e opardy of destruction you can activate one of three smart bombs. These immediately blow up all the alien toices on the screen.

The game is similar in concept to the popular occade came Dafender which has frustrated many players, It's written in machine code to spead up the on-screen action

There ere six skill levels and with 10 phases to get through this tough, compulsive pema could got you hooked to your Atom Monstor

Space Fighter runs on a 5K Atom with 3K graphics facilities. It comes from Leads bosed Atom specialists, Progrem Power and costs £8 95

THESE MEAN STREETS

CITY ENCOUNTERS

Big cities may lure you to teste then delights with bright lights but within them hidden dangers

Stepping away from the traditional satting of Advantura gemes City Encounters takes place in a concrete jungle. The action takes place in buildings, collors, garages and down dark allayways

The object of the game is to see how you survive in the city. At the beginning of the game such player is alfotted vanous physical attributes including strangth, intelligence, and alartnuss The computer also gives players with a run-down on their family background, soom! stonding, financial condition A special feeture of the game

is that at any time you can chack out where other players are A description of how the players are getting on is displayed on the SCIOR II.

City Encounters is the tollowup to another Advantus, Random Dungson Ganerator, produced by Molimers of Bexhillon-See It comes in tape form for the Tendy TRS-80 in 16K The price is £17.10.

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEV

GNOME FROM GNOME

In the House of Gnomes are mores containing dangers which Supermen would be loathe to

You have to wands signed the rooms of the house picking up chiests on your way. When you have collected them all without coming to any harm you amaigs as the winner, beating the computer

But hezerds abound in the House of Gnames to prevent von from winning. The gnomes themsalvas are evil craotures and are warting to taunt and challenge you A snap decision is needed to accent the challenge and defend yoursell, or fo try and bribe thom This game comes from Bug Byte of Livermont and runs on the 16K Sincley ZX-81 If costs 67.

Soon to be relessed from the same firm are a sories of carindges for the ZX-8? which plug jufo the maching. They are full K. agroms which means that if you only have 1K memory the car-Indoes will appraise the memory space giving you a much better

Gamos on the way ere Break out Pinhall Inveders and a 3D mare come The cost of these has not yet been decided but is expected to be F13 or F14

Wandening through twisting fine-

TORTHOUS TUNNELS



WE'RE UP FOR THE - WORLD - CUP

With the World Dup looming on the honzon football is stopping into the computer games

limelight Texas Instruments is keeping up to date with its Five-a-Side Soccer certindge for the TISS/4A computer if sticks closely to the real gome with panalties and looks Only one player has possession of the ball of any time but the apposition can tackle and take the ball into play for his own teem. He's not elways socressful and a slip of the jaystick could meon you sud up a goal under. To shoot or pass the ball you

have to press the fire button You

SOCCER

can speed up the bell by pushing the joystick upwords for a fast bell. Thorn are several varietions of the game and it includes the facility to choose the length of the came and play injury time You have to should be many one is at \$24.95.

as possible within the firm limit Graphics in the game are good but the action of the players seems slow Full sound is incorporated into the game

Five-a-Side Special is available through Til distributors including Currys and Dixons and is priced

Bug Byte s Space Warp rune on \$

the Model B muchine and you'll A

need over 16K memory. The 6

The Liverpool firm is making a

bug nush into the BBC merket.

producing compatible software

and has plans to bring out a

magazina foi BBC micio owners 3

gemp costs Eff 50

WARPED ENTERPRISE

SPACE WARP

Captain James T. Kirk, Mr Speck detailed instructions of how to computer came has cone belose

Space Waip one of the first names on sale for this sought after computer is based on tho popular television sones, end one of the oldest computer games, Star Trak

You have to venture into very

and the rest of the Enterprise crew are going boldly where no - into the heart of the BBC

microcomoufe)



Advontors, the object is to resone a beautiful princess from her captors and collect a total of seven treesures on the route You will find yourself in a natwork of caves a forest, a desert

cuits of your Atom

tend and tortunus (name is during your quest You wind up in a castlo which is filled with evil crentures ready to siriko you down given the slightest oppor-

ADVENTURE

nais and undarground coverns you can find yourself in all sorts You must make a snap decision either to go into combat of trouble deep within the cirwith them, or try and win them over by offering bribes In this game, simply named

Adventore runs on a fully expended 12K Atom end has tokon Program Power about three months to produce because the firm used a special programming rontins which allows santances to be condensed so that you can have a leages vacabulary without need ing to store more words in the



NEW PRODUCTS NEW PRODUCTS NEW PRODUCT

JUST LIKE THE REAL THING . . .

come some of the limitations which hampared the game in the 0831

Written in mechine code the on-screen action is vary repid The firm behind this version, mystery points

for the Sinclair ZX-81 has over-

Guicksilve, has tried to emulate the ongued some as much as possible away to the extent of introducing a rendem flying saucar which - If hit - scnips

The elens speed increases as their numbers deplets. There are three shelds for your filing base to lude helyed and a honny blaster is given after you successfully

wipe out five sets of inveders - ust like the mal thing Filling the screen sie seven rows of 13 invading aliens, and

you can try out your expertise using any of the three skill levels of the name. The lower skill levels of this version seem very slow but when it reaches the complicated stage the envading hardes move errors the smeen with alorming speed

Also incorporated into the game is a facility to store the highest score run up by one player, along with that player's

Quickerive elso produce e cheracter and sounds board for use with this name. The prantics ers very resistic, particularly the siens Sounds add an extra dimension to the game and as you can use the board with other pames, it is worthwell investing

You'll need a ZX - 8t with a minimum of 7K RAM to play OS Inveders, which costs 65.50. Excellent value to money!

WATCH OUT — THERE'S A ROBOT ABOUT!

HOYAGER

space cruiser vons job as a cosmic commendo is to disable the elen ship and destroy the power generators.

First you must locate the generators which are the ship's power source You get a threedimensional picture of the intenor of the ship and you are armed with weapons to blow-up the power snaply. Only when you have done this is your mission accomplished

tuck in space on a stranga district any foreigner on board the shin

In addition to 3D graphics the game comes with full sound Voyager is supplied by Avelon Hill UK and it is overlable for a number of different computers Currently you can boy it in cas-

sette torm for £12.95 It runs on the TRS 80 Colour Computer and standard TRS-80. PET, Apple - both requiring 32K memory - and Aton 408 and 800 with 24K Disc versions will be on

ALIEN GUNSLINGERS

CRATY SHOOT-BUT

Unless you are handy with a sox-shooter you'll never escene from the deadly room filled with hoards of slian creatures

There are two exits from the room but you can only ascapa when you have shot the sliens lucking in the room

You move your man around the room picking off the slow-moving creetures For each one you kill you are rewarded with a number ot points. When all the eliens turn green you know there are only t0 laft to get nd of

You can engle your shots left or night, up or down If you need to you can take diagonal sim at the creatures.

The first wave of baasts is the ensiest. After wrong them out. you make your man run out of one of the exists - teking cere not to bump into any of the deedly redicactive walls

Then you begin the second phase and things out toughts The sliens shoot back at you and Increase in number. Fech stans. gets more difficult as the akens fire back at you with increesing readity

Crezy Shoot-Gut comes from the newly formed Massaft subsidiary of Southand based Maplin Flactionics This meddeningly addictiva gama costs £29.95 (t runs on the Aten 400 or 800 personal computer and is an Amencan non-Ateri Imported par-

tndge

robots that are programmed to (32K) CURVED BRICKBATS ...

BREAKOUT

This version of the popular arcade Brankpert game feetness a curved bet

The idea is the same as the onginal game. Your task is to keep a bell in play by bouncing it off your but Using the joystick to control the movement of the bet At the top of the screen are

severel levers of coloured bricks which you must disladge with the ball For each brick you knock out you sie inwaided with a verying number of points. depending on the layer which the brick comes from.

If you miss the ball and don't catch it on your bat it automatically goes out at play You get three balls to play with. After you have lost the third one the came

Breekout is the letest addition to Bug Byte of Live poor's range of softwere for the Vic computer poced £7 00



V GAMES CENTRES TV GAMES CENTRES TV GAMES

WHERE THINGS GO BUMP IN THE NIGHT...

Things tend to go brimp in the night when you are venturing into a haunted house vie your

Atau Video Computer System Haunted House is the letest name brought out by Alon and it marks a change of teck to: the firm Until now there has only been a limited adventure game for the VCS as Atari concuntrated its expertise on excede

ormes. An adventure come already exats in the range based on the

HAUNTEO HOUSE

The house is addled with ghosts is length of lope or a weepon. You draw a map as you investigate award or destiny. Which ever is

easiest for your own safety You ask simple questions which the computer enswers by

moving you gisphically on the screen Bhinets which you dis cover elso ennear and can help you in your havels Usnally you

and oboutes which you have to can also accuse some money or other valuebles which can be used for bribing any hostile characters you come across. In Adventure gemes you only have one life to play with, unlike

sicade oames when you are orven more. So you have to be extra caraful when moving into

This is a help when you move to a diffarant location because you can look back and ansure you don't po to the same place twice or make the same mistakes more then once

Haunted House is available through Atezr's UK distributors

the house, and describing what

you tound in different rooms



Perman seems to be the help of MUNCHKIN the video screens this year with meny of the Maze games on the

The latest games centre to be affected is the G7000. Philips has named its varaion Munchkin because of the small blob with the big mouth who whizzes around the scient devouring anything in his path

With Mnnchlun on the screon ain three Munchais - which pursue the Mnnchkin - and 17 Munching. Each Manchin is worth aither one point, or three

ints if he is fleshing when Mnnchkn sats hm

Using the handset controls you move Munchkin sconnd the paths of e maze. If your Mnnchkin swellows a Munches ha earns five points for the first one For the second you score to points, and 20 are up for grabs for a third

The Munchers are only vulnerable when the Munchies are finishing difforent colours

All three Munchers have an in-built secret weepon which allows them to racharge their energy in the centre of the maze is a rotating chamber which thay use as their handquarters

Whon one of the Munchers is pobbled up by Munchkin it transforms into a ghost In ghost toim the doceased Munchai hearts for its base and a few seconds later he reappears hungry for more ecton

The game gots more difficult os it progresses Once your Munchkin has got rid of the 12 Monches the maze momentarily class of its inhabitants. Then another batch of them materialMnnchkin to continue esting With each new wove the Mnnchies speed up moking it herde for you to catch thom There is a facility to record the

critient and the highest score Thore are four different standand mazes to play in, plus another toni mezee whose wells disap-

peer when Munchkin is moving II Munchkin bumos bkndly into a wall the mere flashes on the scient for a few seconds for himto gell his beering

You can also make up your own makes by deleting or adding lines to the standard mazes Munchion is available from G7000 stockests and costs about

CENTRES TV GAMES CENTRES TV GAMES CENTRES

When you relentlessly hammer your video centre to death take a breather to ponder over who brought it to life with video

Before you pling a video geme into a console unit it has been through no to six months nurthring by a team of designais and proprammers.

Video camas amarge in their final lorm after several stages and Computer and Video Games talked to expert cames designer Chris Horseman of Wembley based Centeursoft to hed out what those stees are

Often it is the games de soners themselves who think of the onginal idea for a game, but he is always willing to listen to and develop ideas other people come up with

An idea for a game as innovative as Space Invaders is rarely discovered but ideas are always being tossed around in the design room. Chris Horseman. who worked on the Atur comes produced by Thom-EMI gets his ideas from watching television, existing aircade gemes which servé es inspiration, and taking a thems and daveloping it

He will aick up a subject often to do with sport, and develop it For instance the Atan game Jumbo Jet Landing was the result of that mathod

The recent invesion of video games based on space ancounters is becaming repetitive and sometimes dull. That is why designers are trying to get away from that thems "I'm warking on lettle unimals at the moment," Chris said, "and am trying to think of good games based around them ' Judging by the populanty of recent sicade game Francer and Centraede he is on the right track for a winning formula

The essence of a good video game lies in two sections It must be visually attractive, which dossn't mean the screen has to be duttered with graphics that sarva no ourposa It meens the graphics should be interasting and the sciaen colourful And parhaps more importantly there representing the screan and fills must be an element of human anginaanng "That maans there must be something in a gama that you don't always sas," he banulaxs

11HE 10 00 ##### F\$QAA\$ 111 **** * * * * * * 11111 * * * * * + + + + + + ++++ + + 11111 1100 10.00 :000 T TOE. 00.00 · COURSE IN 11111 +++++++ ****** iiiii parasa 4 4 4 4 4 4 4 11111 +++++ *************

random intervals during Space Invedors? That's an example of human engineering Because you never know when it will applies and because it requesants a bigh points scom, the hidden element makes the game more compul-

Then the designal must decids exactly what the game well consist of kneping within the realms of programming feasibil-

Orawing doodles may be an idle nashme for you but to Chins it is a crucial job. "Evan though t sometimes do them on the train thay are a very important stage în making a vidao gema " He roughly draws a square box

it with a game idea, Currently working on a ski-ing game he had drawn on the screen the slopes and diffarant landscape posabilities, the skiers positioning in Ramambar the flying saucer relation to programming, end the

Once he has arrived at what looks like a viable game the designer takes the proposals to the marketing experts "The real headache is marketing " moans d Horseman "The marketing people sisn't anough in tune with the market If they are they will probably meet to a game in

the same way as the consumer " The decision to carry a pama's idea through to production has with the merketing chiefs so it is imperative that the designer can show them a clear picture of that овпта

From these it goes into the figure down by et least half hands of the !

programmar Now it is up to him to tiens late the gema to the screan Usually ha spands about thrae months solidly programming, eix months il the game is an exceptionally complex one

It is often inevitable that a game will change during the programming stage, as the programmer can spot little additions to improve the game as it

appears on the screen "Some change quits a bit from the onginal concept, but it depends on a programmer's cientivity." A good games proprammer should have a creative mind and the ability to see what

can improve a game, or what detracts from the name According to Chris, finished Aten games are exactly the same as the original design This is because Aten works on a system of very strict documentation which the propremmer uses like

e manuel It's a very strict system with notes that the appointment most stick to at every stage. He must also keep to the time scale laid down in the documentation

Problems in programming video names centres lie in the lack of mamory capacity "Thay have a very limited memory so the programmer has a very diffiguit tusk to do

That's why the programmers have to know the machine inside ont to program for it" That is why the only two hrms to set up as independent software andpliers for the Atmi VCS, Actvision and limiting, nin axperienced ex-Atan employees

Once the programmer has got the game ronning from start to finish the designer photographs each stage of on-screen action and puts the pictures in a "atory book" which he uses as ammunition to convince the marketing heads of the game's viebility. Usually the games are tested informally on the amployees and often their children, who are often good indges.

The cost for a big firm could run to £10,000 but smaller firm: can cut spanding and bring the

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int33

moved his King away from 53 – to a3 for example, but not a2 where it would itself be in check discavering check by the

Bishop on a4
Unfortunately on b3 the White
King is in double check by the
Black Rook and Bishop. What

was Black's previous move?

There is no possible Roak or Bishop move by Black which produces the required double check configuration, apparently another example of on imaginary check. In fact, however, this one is only "pseudo imaginary".



since the desired effect can be achieved by an en passant Pawn capture. Figure two shows the position shortly before.

Black has just moved his Bishop to give check. The game continues 1, c2-c4, b4 x c3 en passant; 2 Kb3 x c3, giving figure one. Thus, the White King originally stood on c3.

This example illustrates a number of important features of etrograde analysis problems

Firstly, the phrasing of the question does not immediately suggest that any backward analysis of the position is necessary, but the problem cannot, in fact, be solved otherwise.

Secondly, it is crucially important to think of asking the right questions

Care must be taken with

imaginary checks; a move may have involved a capture including an en passant capture, a piece on the eighth rank may represent a promoted Pawn.

It is important to note that solves this prob trograde analysis problems do as well? Solu

are generally not concerned with strong sequences of play, or even sensible ones, but merely legal ones. Underpromoting, that is turning am eighth rank pown into something other than a queen, is quite legal (even likely) in these problems

A researcher at Bristol, Brian Alden, has recently written a program which solves quite a number of retrograde analysis

a b & d e f g h problems and later I will look at

this in some detail.

In the meantime here ore two
more problems for you to consider. The problem given in igure three is quite simple. To
program the solution to this and
the previous one you have to
write a reverse legal move

The rightmost Pawn in figure four is not o printing error. It is deliberately placed halfway between the a file and the hile.



Pawn stand on g2 or h2? It is White to move and as a cryptic hint, you are given that there have been no "underpromotions". Brian Alden's program solves this problem can you do as well? Solution next month

Everyone knows computers can play chess — but they are also very able problem solvers.

An intraguing type of problem on which little work has been corned out so far is the retrograde analysis problem. These problems, unlike conventional ones—with requirements such as "White to play and mate in three moves"—are concerned only with the past history of pass-

tions.

A recent collection of retrograde analysis problems by the American logician Raymond Smullyan was presented as a series of chess detective stories, entitled The Chess Mysteries of Sharlock Hollage.

Here is a — relatively simple — example invented by Smul-

It is Black's move. The White King has accidentally fallen off the board. The problem is to place it back on the correct

At first glance, this problem seems unsolvable, or rather, there seems no reason why the



King cannot be on any one of many possible squares. The key to the solution is to notice that the Black King is in check.

Since White moved last, what moved did he make to give check? If the White King were on h3, say, it is impossible to "unmake" any previous White move which takes Block out of check.

This is an example of what is known as an imaginary check. Since the initial position is known to be legal, the only possibility is that White has just

ZX-81

ZX-80



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STAYING SHARP . . .

Making your computer play well con - as a banus - make you think more clearly too.

Somehow, you need to give it a sense of judgement as good as your own, to make it play a nerve-wracking tussle against you. Ideally a program should be able to beat you as often as you beat it. But as a human, you improve with practice, whereas the computer cannot, unless you update it with improved logic. You can do this if you have written it vourself.

That is what I have been doing in great depth on a Sharp MZ-80K, to provide me with a reasonable apponent. As a top British player, available programs were no good to me. Ideally I wanted one up to my standard - and repeated updates improved my game tool

This article is intended to help both you and your computer play Reversi - also known as Othello - more skillfully, by three simple rules-of-thumb. They form the backbone of my program, and have been balanced by practice trial-and-

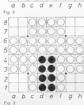
Thumb 1: The whole game is about copturing corners, as then you can safely expand from the captured corners without risk of capture yourself. So a general rule is take a corner whenever you can, and avoid playing next to the corners for fear of giving your opponent a chance to take it. Generally, the nearer you play to a corner the more dangerous it is in the long-term. So set values as in diagram one. making the machine select the most negative valid move.

Thumb 2. You want to force your opponent to give you one or more corners as early in the game as possible. So you want to force him by giving him no option. The best way to reduce your opponent's options is by taking as few pieces as possible The Reversi column box been taken over by John Ball this

month. Jahn is a co-author of the bank. The Key to Othella and a regular U.K. Othello finalist. He has also written a Reversi program for the Sharp MZ-80K, avallable from Sharosaft. We will continue to look at comnuterising Reversi every three months

							29	
7	29	22	3	2	2	3	22	29
6	5	3	1	1	1	1	3	5
5	4	2	1			1	2	4
4	4	2	1			1	2	4
3	5	3	1	1	1	1	3	5
							22	
1	-9	29	5	4	4	5	29	-9
	а	Ь	С	d	е	f	9	h





- but don't lose them all! With that ploy, you can easily slaughter any thumbless human or muchine. Once you have the corners secure, you then get revence.

In diagram two, the square that captures least pieces for Black - D at h7 - forces White to give a comer by playing at A or C - it is the best move. So gay move that takes lots of pieces early on must be bad. Add points to the value of such saugies to dissuade the computer playing there.

Thumb 3: Early on, if you take a side you might feel it a good way of restricting your opponent's options - which is true. But at the end, when corners fall, he who has the sides generally loses Look at diagram three Black to play. Black will lose all four corners - but win massively. Try it!

So avoid taking the sides by spotting when side pieces would get captured, and again make such squares less attractive

Balancina thumbs: Na single thumb should totally over-ride any other. Sometimes it is better to take lots of pieces - if it avoids giving away a comei. Capturing a side isn't all that disastrous - so in diagram two. if it is White to play then P at h3 is far more preferable to A or C in the corner. So only add a few points to the side capture value It also takes two pieces - but is better than the alternatives of capturing only one

It is surprising how careful balance of thumb values can encourage good effective play. My Thumb 1 comes values are deliberately big. The squares next to a corner are ugly, while the corner is a luscious -91 The diagonal value is 22 - quite a bit preferable to the 29's - in my expenence if you have to give a corner away, do it diagonally, Nine times out of 10 it is best.

Of course, there are times when the thumbs are not valid at the end you want to capture as many pieces as possible.

```
* RELATIVISTIC STARSHIP SIMULATOR
30 '
108 / SET UP VARIABLES
120 DT=0 DELT=604800 ' TIMESTEP: 1 WEEK (SECS)
IGO TO=0 T=TO ' ERRTHTIME & SHIPTIME (SECS)
140 V#=0D0 ' VELOCITY (NETRES/SEC)
150 A=0 G*9,80665 ' ACCELERATION 1 GRAVITY (MYSEC/SEC)
160 AMAX=10 ' MAXIMUM THRUST 195
170 DR=0 ' DISTANCE FROM EARTH
IBD SYMBISSION ' SECS/YEAR CONVERSION
208 C#=2.997925D8:EC#=C##C# ' YELOCITY OF LIGHT
210 TAURI MASEL ' RELATIVISTIC CORRECTION FACTORS
1000 ' SET UP DISPLAY
IDIO FE="%%, *****EEEE " G#="%%, ****************
1020 S#=STPING#(9,143)
IMAM PRINTS$" STAPSHIP 'FANGLORD' INSTRUMENT READOUTS ":91
1848 PRINTPIRE, "VELDCITY", TAR(36) "METRES/SEC", TAR(50) "TIMESTEP"
1050 RRINT"V/C (TO 16 PLACES)", TAB(49) PPINTUSINGF$+"YR", DELT SY
TREA PRINT "ACCEL FRATION" TAB(25)"0" TAB(36), "GRAVITIES"
TOZO PRINT"FORTH TIME" TRR(36) "YEARS" (TRR(50)"TIME LAG
1080 PRINT"SHIP TIME", TAB(36); "YEARS"; TAB(EI) "YR"
1100 PRINT"DISTANCE FROM ERPTH", TAB(36); "LIGHTYERPS", TAB(61). "KM"
1110 PRINT" APPARENT DISTANCE", TAB(36); "LIGHTYEARS"; TAB(61)"KM"
TION PRINT
1130 PRINT"'TRU' FRCTOR"
1140 PRINT"SHIR MASS INCREASE", TAB(43), "(AS SEEN FROM EARTH)"
1160 PRINT"TO INCREASE/DECREASE/HALT ACCELERATION, PRESS + - /0 KEYS"
2010 PRINTRISS, USINGE: VW. PRINTR216 (USINGG: PM)
2020 PRINT2944.USINGF$.TO/SY,
2030 PRINT8408,USINGF$.T/SY; PRINT2433,USINGF$.(T0-T)/SY:
2040 PRINT9536 USINGF# , D0/ML , PRINT0561 USINGF# . D0/1000 :
2060 PS INTP728 . TRU!"
2070 PRINTET92, MAS"
3000 ' TEST FOR SUCCESSFUL "RETURN" APPROXIMATELY TO EARTH
3020 IF(ABS(D0))DCOK)THEN4000 ' SHIP "CLOSE" TO EARTH
3030 IFVELBG=1THEN3050' ZERO "ELOCITY BCHIEVED IN LAST DT
3040 IFABS(V#). VDOKTHEN4000' "LOW" VELOCITY
3050 PRINT9896, "CONGRATULATIONS" YOU CAME CLOSE TO EARTH AGRIN, WITH LOW "
3060 PRINT"ENOUGHVELOCITY TO DOCK SAFELY, (PRESS ANY KEY TO RESTART)".
4000 ' ACCELERATE DECELERATE INPUT
4020 IFR#=""THEN5020
4030 DT=DELT ' START TIME COUNT AT FIRST THRUST
4040 TEAS="+"SHIDB/AMBXTHENB=8+1-GOTO5010
4050 IFR#="-"ANDA :- AMAXTHENA=A-I : G0T05010
4060 IFA$="0"THENA®0
5000 ' CALCULATE NEW VALUES
5020 DV=8#G#DT VELOCITY INCREMENT
5030 V2**(VB+DV)/(100+V**TDV/OC#) ' EINSTEIN VELOCITY ADDITION
5040 TTBU=SOR(IDO-V2**'C#) TAU EQUATION
5060 T=T+(TTRU+TAU **DT/2
5070 D0=D0+(V#+V2#)*DT/2
5080 TAU=TTAU
5180 IFSGN(Y# 11)SGN(12#)THENVFLAG*1ELSEVFLAG=0
5110 '7#=VC#
5199 P#=1'$ (C#
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it you want a realistic space

In science fiction there are as many ways of commutmo to the sters as there are Smith's cosmically ridiculous

Unfortunetally it seems than something called hyperspace es in elmost any Isaec

mg spacamen great technical

point the ship's mass reaches Also, as c approaches the

m hordes of "realistic" SF novels like Robert Hemlein's

if vis the velocity of the ship

Al low speeds tau is

rowards zaro but can naver Our reletryistro starship's

mass is its stationary mass dryrded by tau it seems to viewpoint. Its length is multitron before writing relativity

Normally, if you're travel-

Here's a crude TRS-80 nary stership You can give crushing 10G

The display shows your reel and apparent ishrunk by and tau itself

The ship's mass imprease

This is mainly a demonstra

away and back? Can you

The 'target' distance and une 220 and can easily be

As well as blowing people's minds, relativistic calculatrons can boggla homa

Postnote to program The in line 120 makes the program





DRAW YOUR OWN CONCLUSIONS

TIPS ON BIX



making their minds up about the same which has no theme but the industry leels Qix is pointing the way to the video cames

Tectically the game is still an entome as players develop their own styles and evan set their own come targets - like drawind dictures or outting their own initials on the screen

We have decided to give tros to gain a really big score on one

the existing lines and into the realm of the Dix. a large spark which most be avoided Additional problems are the Sparx Spece capture is the name of which travel along the border of the screen and up the loss you the came as your drawing head ventures off the relative selety of have drawn and the Fuse which chases you along an unfinished ine if you besitate in source

> Donble acore is awarded for drawing in "slow mode" which fills the boxed area in with a red rather then blue colour. Observent fix players will already have noticed that you can score 1,000 bonuses for every percent of the screen filled in, over the 75%

> you need to eern a new screen. The third way to score highly is to ank! the fire into two. This is done on the third screen when two flor which around

The way to achieve all these ideals is to start the name by drawing thin blue boxes off the bottom of the screen. Two of these set a law inches apart can be added to by a third thin blue hox which runs from the top of



of reach and as the Sparx conbaue their hectic dash eround your knes you will be forced to keep on the move Keep adding to a network of

thin blue boxes and give yourself more tracs to ternot the Dix into Long vertical chembers provide patimistic - but high-sconno chance of success. Always keep an eye on the

timer - which will ralease faster Spary to chase you - and the percentage of screen filled yon don't want to go over 75% nntil you are ready.

Yon won't get a long time on Dor but you will not a challenge 99% hee been done!



Humbur is a very parsenal thing and in every batch of cortoons sent to a magazine there are a few which will appeal to someone.

fan Bennett sent in an arcade series of carloons which appealed to us and we will be presenting our favouries on these pages over the next few (SSVes



RECORD BREAKERS

How do you rate in the arcade

world On the right we tail how

four students set a new Aster-

olds world record, but how close

are you on your favounte me

china to being a world beater?

Hare are some of the highest

scoras wa have come across on

chines around. If you can better

them, or have a too score on

some other mechine (what about

Donkey Kong?) we would like to

Michael Holdron

Richard Ruddick

Joseph Andrews

hear from you

Gorf

228.570

Phoenix

John Lea

Battlazona

Moon Cresta

126,950 Andrew Davies Packman 281,260

Scramble

some of the most popular me

KFNT **OUARTET TOP**

Four students from Kent University have blasted their way into the arcade game record books by

topping the 100 million mark on David Birkett, David Hill, Yony Thomas and Alan Tilling took on their university's Asteroids me-

chine in shifts to achieve the It took them excht days after starting at 4pm on a Fnday and

playing through to 7am on Sunday, over a week later The record attempt took place

and made around £250 tor Sorna Arfida sufferare





Galaxians 431.820 Stewart Mathers Missita Command 2 480 000



ALPINE SKI IT'S NOT ALL

DOWNHILL ON THE SLOPES

St Montz is only as far away as your local arcade with the new game of Algina Ski

The game offers three winter Olympic disciplines, downhill sialom and ski-ump. The first frame is the downhill

with obstacles to be dedged These include, trees, other skiers and avan a snowplough To help you avoid these hezards, that a is a good left-right control and en accelerate or push button Which simulates the skin i pushing off It needs caraful timing to

endge a swarva around a troe Other feetures of the course Include, iced up lakes which acors a bonus but shoot you across fast, and increase your

The second leame leatures the elelom with pates made up of flans for the skier to pass between. Each but flea knacks 100 points off your score, while 50 to 300 points are notchod up for each one successfully negotiated

Finally the skiel is faced with a ski-min Judge your take-off carefuliy as plenty of points will be scored for a long jump And a good score here could

make sure of a bonus time. The shar most wait until he has enough speed before taking off The basic gama lasts to 2)

minutes, depending on the oneustor bot bonus time is ewarded In a hroh score of either 5, 10 or 15,000 points and tor each t0-15,000 points after

But as the course gets more difficult, time bonnses are more difficult to win.

Fest reactions are needed to dodge obstacles and align the skier with the next slalom gate and the came rewards the player who can think and look beyond the immediate target to piecers himself for the following one

Scando Gemes, which is dis-

tributing the geme over here, is

plenning to prospise learnes and

other championships through the

ten Jerusson of Scendo claims

that Dribbling championships

have already proved successful

in Italy with World Cup tickets

being put up for prizes And one

final plus the crowd in the

Dribbling stadium never cause

any trouble!

pubs and arcada situs

Pinhells are already talkies now they have taken the plunge into

The letest offenng on the proball scane features slids shows which are won by the pleyer if he hits turnets in the collect

the film world

The film machines come in two valuation The Saxy Girl sames leatores nine different slide shows of gula stripping off Tha him is projected onto a 9" aquare screen in the centre of the play-Reid There are 36 different slides and according to Kerth Frankham of distributors Rage, only accomplished plevers will see all 36

The gul tinishes up in a 'page 3' pose," said Frenkhem The Magic Picture Pin series is

a different pleyfield and features films of more general themes, like space pictures boats and animals. There are seven in this

These games have only just been released in this country," said Frankhem "So it is too early to say how they are going but they have proved very successful In Garmany and are played for a much longer paried than other penball machines"

DRIBBI ING THAT OLD WORLD CUP FEVER

The ercades are going to cash-in an the World Con lever this summer with a new table-too Soccet dame. The thirst for soccer will be sated by Onbblar - an electronic

version of the old Bar Football The new tootball game has

savaral advantages over its predecessor, for example, it allows the players to choose their team colours from six different strips. This game originated in football-crazy Italy and on a parfect green pitch, which would

even send Q.P.R. fans into reptures, two teems of seven-a-aids battle it out over 90 minutes compressed into two minutes for excitmenta sake Two layers, on each side of

the table take the place of the of the machine four fundles which used to ect as controls on the manual varsion The left-hand-side level controls thise forwards and the

right-hand-side three defenders and a goalkeaper The players can be moved back-and forth across the ortch but they can elso dobble the bell

forwards A fire button enables the player in possession to shoot or pass and if he hangs onto the hall too long lover three secands) this will happen automatscally The defending player can

move his men into tacking positions and hope to deflect the ball away or sand his keeper diving across the goalmouth to push a shot away Throw ins are evoided but it is

nassible to win a corner These ers thurned sciens the onalmouth by the machine itself with both datanders and attackers hooing to make decisive contect.

The referre's whistle keeps the game flowing and the time left end present score is displayed on both aides





OOF 3 OXEOND STREET







Ever fancied being a property speculator and making millians? Well, with the help of your Sharp you can get a taste of real life wheeler dealing in this adaptation of the famous board game Monopoly. From two-to-five people can play the game and £5,000 is divided equally

among the players. The winner is the one who survives bonkruptcy lor longest or accumulates a nest egg of £5,000 in his bank account.

Moves are determined by a random selection of numbers from 1-to-5 which are printed up on the screen and the player must try to stop the small arrow which loops above these over the number of his chance. This is an interesting idea which allows some skill into the final result as there is usually at least one number you can avoid il you are sufficiently dexterous.

The gam is to buy property for twice its rental value and then increase the

rent by pouring in more money on subsequent landings. Just like the board game rents have to be paid to opposing players if you land on their property.

A current bank balance is displayed at the top of the screen at the start of each player's turn - so you know just how much cash you have lelt to splash out on desirable residences.

If you get into financial difficulties you may sell property for one and a half times its original value by pressing the (S) key. But if you have no

property to sell you face bankruptcy.

The author says the idea for the game came about as he found other computer games became boring once the player had mastered them. He claims Minopley is a game which requires a reasonable blend of skill and luck and presents different challenges each time it is played. He adds that once the game gets down to a battle of wits between two players it can take some time to reach a conclusion.

Here are the uses of the main variables/arrays in the program.

AS(N) Name of player

A(N) Player's bank balance Z(N) Player's "Symbol"

NO Number of players at start NU Number of players lelt as the game progresses

Y Defines which player (e.g. his turn to go)

PO(Y) Position of a player "Y"

P(Y) Number of moves that player has made (0 to 24) R() Rent or Debt to be collected etc.



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The dK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you 448 extra pre-programmed graphics, your normal graphic set contains 64. This means that you now have 512 graphics and with there inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM), However, the module does not finish there: it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder is fittad with a 1K/2K RAM and can be used for user defineable graphics so you can create your own custom character sets £29 95

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As seen at the ZX Microfair

DEFLEX This totally new and very addictive game, which was highly acclaimed at the Microfair, uses fast moving graphics to provide a challenge requiring not only quick reaction, but also clever thinking. One and two player versions on same cassette. £3.95 3D/3D LABYRINTH You have all seen 3D Labyrinth games, but this goes one stage beyond; you must mangeuvre within a cubic maze and contend with corridors which may go left/right/up/down, Full size 3D graphical representation, £3.95

CENTIPEDE. This is the first implementation of the popular arcade game on any micro anywhere. Never mind your invadars, etc., this is positively stunning, the speed at which this runs makes ZX invaders look like a gama of simple snap. £4.95.
Graphic ROM Software Cantipeda. The graphic ROM version of our popular Centipede game. The only real version of Space Invaders on the ZX81.



23 Sussex Road, Gorleston.





is one of the most difficult manoeuvres a space pilot hos to deal with. In Earth-Part II you have to land you ship safely in the docking bay of a spoceport some-

At the start of the game you enter your military rank — you can chose between privole first class, corporal, captein, major, colonel and general. The higher your rank, the harder the gome becomes.

You control the spaceship by using the four arrow keys. The program will respond when two keys are pressed at once. For example the down and lell arrows logether.

Once you have guided your ship safely to within a certain proximity of the spaceport, your on-board computer will automatically switch your view screen to a close up view of the landing bay.

There's a slight catch to the game too. You have to land before your limited supply of oxygen runs out. The higher your ronk the less oxygen you start out with. High rank is obviously a hig drawbock—as the

more stripes you have the greater the initial momentum of your ship. At the rank of general you have only seconds to prevent a fatal crash.

The variables are: O, the amount of oxygen remaining. HS. horizontal speed. VS, verified speed. SL. trank or difficulty level. BS, where tank airing is stored. X-Y, for next variables for graphics. A. displaying points. PS, variables used the read date for constructing landing pod dome.

BY WILLIAM PHILLIP CASE

EARTH-PORT II

(C) COPYRIGHT 1980

NY WILLIAM PHILLIP CASE, JR.

2 DEFENTE, Y.A

3 CLEANIOOD: CLS: DEFINTA, X-Y: PNINTCHS: (23);"
EARTH-PORT ::"

4 CLEARIO00:FORY-[ID128:B1-98+CHR\$(RMD(40(+130):A5-A5+CHR\$[RMD(4 0)+130):C5-C5+CHR\$(RMD[40(+130]:AEXT 5 CLS PRINT PRINTABILIST ENTER YOUR RANK PRINT PRINTABIZAL PRINTABIZAL PRINTABIZAL PRINTABIZAL SCORPORAL PRINTABIZAL SCAPATAN PRINTABIZAL A MAJOR PRINTABIZAL SCOLONEL PRINTABIZAL SCORPORAL INFOLINEST PRINTABIZAL SCORPORAL INFOLINEST PRINTABIZAL PRINTA

21 Rs="PR:VATE EIRSI CLASS": BOT030 22 Rs=" CORPORAL": BOT030

23 R4=" COMPORAL": 801830
23 R4=" CAPTION": 801830
24 R4=" HAJOR": 601830

24 Rs-' MAJOR':601930 25 Rs-' COLONEL':601930 26 Rs-' SEMERAL':501930

30 PRINT@934,RE; 35 E1-54:1(+32

40 HS=SL12; VS=-SL; D=30+(60-(SL1[0)); I=[0; Y=[0

45 BOSUBILOGO: PERFORM PRIMARY APPROACH ROWLENE

45 FRINTA769, STRIMER (AD, (91)+CHRS (190)+CHRS (190)₁₂; RNINTA705, SIRI MESH22, 1971+* LSHOTHS BAY **SIRINGS (22, T91+CHRS (1881+CHRS (176); FRINTA641, SIRI MES (22, 1971+CHRS (187)+STRIMES (6, 174)+STRIMES (22, T 411+CHRS (1881+CHRS (176));

47 PRINTGS77, STRINGS (25, [4]) +CHRS (149) +STR(MSI (6, 32(+STH) MSI (20,

19(+)CHP\$(1801):PRINJ\$SI3.SIRJND\$125.18](+CHP\$(249)+SIRJND\$16.32 SOOD PRINJ\$BAS.*SUCCESS*** 100*VE LAMDED***:PRINJ\$S32.STRJND\$12 G-CHPs (1/01 +STRING\$117, 1911 +CHR\$11201;

49 PRINIS449, SIRING\$(25, 1911+DHR\$(144(+51R1N5\$17, 321+CHR\$(1841+\$ 181NE\$[[4,191]+CHR\$(189]::PR[N12385,STR[NE\$(24,19]]+CHR\$[[8]]+81 RINGS (9, 321+CHRS (1851+STRINGS110, 1911+CHRS (1211+CHRS 1164)+CHRS (1

761: 49 PRIN1932], STRINS\$124, [9][+CHR\$1[49]+SIR1NS\$110, 32]+CHR\$1[76]+

CHR\$11801+CHR\$11841+S181NG\$17,1911+CHR\$1148(::PRIM12257,S1RIMG\$1 24.1911+CHR\$[]48(+STRING\$[]3.32[+CHR\$[[70]+S]R[ME\$[3.19][+CMR\$]]

741+CHR\$11+01+FHR\$11441+

50 PRINTAL93, STRING&127, 1911+CHR&(190)+CHR&1189(+STRING&115,321+ \$101824/2 [0][+FH04](48]++001812179 \$101854[0 [0]]+FH04[180]+FH R\$ (178 () STRING\$ (18, 32) + CHR\$ (1601+CHR\$ (1801+

51 PRIN1965.5181N6\$119.1911+CHR\$(L49)::PRENT91.5TRENG\$(L9.1911+C

55 BUSUBLOOD: GET REPORTS

40 BOSURZOOG: IMPUL VALUES 65 D=D-1

75 885833000

TH SOSTRIGOG

805384000 100 801855

200 PRINT2868, 'YOU HAVE RAN OUT OF GEYSEN, ": : PRINT2937, 'YOU ARE DEAD "" :: FORA=1701900: NEXT: 80105

[000 PRIN19834, 'V. SPEED ="| INTIVS#1001; "| : PRIN19898, 'H. SPEED =':1M1[MS#100]: '::PR1M19853.'8XY5EN =':0::1F0<20PR1M19917.'GX



1010 RETURN

2000 [FPEEK | | 4400| = 81 HENVS=VS+1ELSE| FPEEK | | 4400| = 14THEWVS=VS-1 2005 [FPEEX | 14400 | = 321 HENHS=HS-JELSE1 FPEEX |] 4400 | = 841 HENHS=HS+J

2018 [FPFFK: 144001=40605HB2100

2015 | FPEEk | | 44001 = 7268SUB2105 2020 IFPEEX1144001 = 4BE08U92110

2025 | IFPEEK (14400) = 8080SUB2115 2059 RETURN

2100 MS: HS-1: VS=VS+1: RE1URM

2105 MS+HS+1: VS+VS+1; RE11IRN

2110 HSHHS-L: VS-VS-1: REI URM

3000 RESE, IX, Y1: RESE118+2, Y1: RESE118+1, 1-11: E=E+NS: 1=Y-VS: 1FE>12 21HENX=122ELSE1FX(3THENX=3

3010 IFYCSTHEMY=3ELSEIFY>36THEMY=36 3015 (FP01NT1X+1, Y-110NP01NT1X+1, Y)GRP01NT1X+2, Y) THEN6000

3020 SETIE, YI: SETIE+2, YI: SETIE+1, Y-II: RETURN 4000 LEPOINTIX, Y*11ANDPOINTIX+1, Y*11ANDPOINTI1+2, Y*11ANDHSK3ANDH S>-SAMOVS>- SAMOVS (STHEMEDSUBSOOD: "SUCCESSFUL LANDING

4500 RETURN

5005 PRINTARTALINA, SPEED & D. TEIPRINTARRE, N. SPEED & D. TE 5010 FBRA-LTD5:READP. R. R. S: SELIXI+P. YI-Q(: SEL(XI+R. 11-S(: FORB=11 DSD+MESTS & SECTION

" : A\$R:: NEXTA: PRINIPP32. "PDINIS : ':D: '.................'s

SOTO PRINTSHAT, 'PRESS ENTER 10 PLAY ABAIN'I 5040 INPIDA: 90105

5500 68105

ADDO CLESFORS: LTDM: FORY: LTDM: PRINTER: NEST: PRINTERS: 28(:: FORS: 1 108: PRINIDS:: NEXT: PRINICHRS (281:: FORY-1108: PRINICS:: NEXTY: PRINIC

HR\$ (28]:: NEXT AGIC PRINTAREO, "YOU CRASHER" IN SRE DEADLESS SECREDITOR 900: NEX1: BBI 05

7000 JEPOLNTIS V-1108POLNTIS+1. YIBBPOLN113+2 Y-1108PBIN1(X-1 Y/B RPO INT LE+3, YERREIRAGGE SERFILIEN

8999 ' 20NE DATA = 24 ELENENIS 9000 BA1A0.1.18.1.1.2.9.2.2.3.8.3.3.4.7.4.4.5.6.5.5.5.5.5.

11000 * NATER APPRIACH

11010 PRINIAL41.SIRINES([0.19]]+DHR\$(149(; 11011 PRIN12705. S1R1MS4111. 1911+CHP411RR1+S1R1MS4/50. 1911++2R1M1

2769, STRINGS162, 1911: PRINIGS53, DHR\$11901+ SIRING\$129, 1911+CHR\$(1 \$91+CHR\$[]@01+CHR\$[]\$44+CMR\$[[\$B]+STR[MG\$[16,[9]]+

11012 PRINT2577, STRIMGS (9, 191 (+CHRE11881+CHR611481+STRINGS12, 32) *CHE\$(140)*DHR\$[190]*SIRING\$(25,19][*CHR\$[19])*CHR\$[176]*CHR\$[176] 41+STR195613, 321+DER611761+DHR61184(+STR19561)4, 191()

+FMPE: 17.61+FMPe11901+9191MFE:17.191+FMPE: (1811+9191MPE)2.17.61+FM RE11901+CHRE(191++CHRE(180++S1R1NS&+0,32++CHR&11841+S1N1NS&+12,1

11014 PRINTS449, SIRING\$(3, 1911+CHR\$(188)+CHR\$(175(+CHR\$(144)+STR \$13,321+CHR\$11&01+CHR\$1180(+S1R1M6\$112,32(+CM\$1140(+FMR\$11901+S 19195419.19111

\$5015 PRINT23RS, CHR\$: IRRI+R1R1NR\$(10.321+CHR\$117.61+CHR\$11961+CTR INS\$19, 1911+CHR\$1189)+CHR\$11761+STR1N6\$126, 321+CHR\$(1761+CHR\$118 41+51R1NB\$17, 1911: 11016 PRIN12343, CHR\$(1841+S1R1ND\$17, 1911+CHR\$(1001+S1R1NG\$125, 32

1+CHR\$[176]+CHR\$[188]+CHR\$[190]+STR[N6\$[3,19][::PR[N19280.CHR\$(] 501+CHR\$[190]+S1RIME\$[4,191]+CHR\$[144(+STRIME\$128,32]+CHR\$(140]+ CHR\$ (1841+57R1N6\$12,1911) 11017 PRIN12218, CHR\$1[88]+CHR\$1[9]]+CHR\$:[80]+S1R1MG\$[33,32]+CHR

\$11761::PRIND2155,CHR\$11441; 11020 PRINTS412, CHR\$1911+CHR\$1251+SIRIN5815, 241+1 LANDING "+CHR\$

1261 *STRING\$17,241** PAD '1 11030 E0SHB1000: E=S: V=3

11035 B-8-1+1F0(01HENZ00 11040 605U91000: 80SU92000: RESET11, Y1

1|050 1=I+|HS/2| 11060 1×F+1VS/21E-1

1 1070 TEXCSTHENT: SELSETED 1 241 HENES, 124

11080 JF1(2THEN1=2 [[082]F1>70AM01<77AM01>23AM01<261HEMRESE1|1, Y1:80SU812000:8010] 1900

LLOSS JEPSINILE, YLIHENAOOD

[1090 SEI[I, Y]: GOTB11035

11900 FORA=65TB70551FP64:PRIM190.STRING\$ (62,321::MEET:PRIM19769. \$1RING\$162,1761: 11999 BEILEN

12000 PRINT@867.STRINE#127.321+CHR#(261+STNING#127.24(+STNING#12

12001 HS=1 COMPLITER REPORT: THE CLOSE-UP & CANNEN REPORTS LANGING PAD IN VIEW, NOW SMITCHING VIEW SCREEN 10 *+ FORAXI TO ILEX (N

DI OSE- UP SCHAWEN. \$1-281; PRINT@931, MID& FH&, 4, 2B(:

12002 FORBATTOTO: NESTS, ALBETURN



1 REM### PUCKMAN ### 2 REM

3 REMA** BY S.F.MABLEY ***

5 REM### INSTRUCTIONS Ex E. SHLMUN ###

10 PRINT"TROGRAPHIOULD YOU LIKE INSTRUCTIONS NO"

28 GETAS: IFAX=""THEN29 30 IFR#="Y"THENDER

49 GOTO388

58 IFJ=PANDVAL(TI#://ITHENI=0:M=R:J=H:II#='000000':Z=F1

68 TET-HANDVAL TTS -- TTHEUZIR

98 IFA#STHENB=1:POKEC.U:C=C-T:G0SUB188:PULEC.V:G0T0138

RUNS ON A 40 COLUMN PET

- 180 IFC=C1THENC=D1:GOTOS90 198 TECHELIMENUEEL

- 10 IFD=P10RD=P1HENIFFEEK E+P : C/G10PPEEK(E-P) >G1THEND=INT(PND. F1 :e01:+P

- 429 PRINT" M SECOND DESCRIPTION OF THE PROPERTY OF THE PROPERT
- 440 PRINT" . GERMANN. SERVICE. STREET, STREET,

- 500 PRINT" N. WARRENDER, WESTERNER, THE STREET, SERVINGUE, 4" 518 PRINT" #, W....... *** *, ***...... ** * 5.5**... ** **

- 590 PRINT" \$.....
- 600 PRINT" N. STREETENS S. N. R. N. SECTIONS, 6"
- 640 PRINT"

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684 PPINT" THE MAZELS THE PHANTOM OF THE MAZELS
   630 PRINT"MONYUU SCORED ";H:" POINTS"
    718 PRINT" DROWING THE RAN OUT ON YOU I'M HERAID BUT YOU .
    720 PRINT" MEDID MANAGE TO SCORE ":H;" POINTS"
    740 PRINT"ANTHE TOP SCOPE IS" IS
    750 FF INT " MORREPORD PPESS & SERCE" W TO TRY HNEW!"
   760 GETLL#: IFLL# 'THEN: 60
   780 PRINT" 2" : PRINT THB: 13) : "INSTRUCTIONS"
  YOU PRINT" MITHIS IS THE GAME OF SHUCKNIH IN
   SUM FPINT" MERSED ON THE NOBLE GAME SEEN IN MANY
  318 PRINT' MITHE TOER IS TO 'MUNCH' AS MANY DOTS.
  120 PPINT BHOMEVER YOU MUST BEHARE THE 'PHANTOM
                                                                                                                     MHO HAUNTS THE MAZER
  180 PPINT" # SCORING
  50 PPINI" ATHE DOT: SCORE 10 POINTS"
  ade FRINT"M BLOGS
  ETO PRINT'S
  380 FRINT" SPENDENDEPRESS SCHACE M TO LONG"
  980 PRINT"D"
  HO FRINT" MCHONEVER
  930 PRINT MEVERY 30 SELDNOR"
  OU PRINT'MHE 'FHANTON' HAS AN AGROVING MARTY OF TURNING LUMINOUS' OF PRINT"MHARD IT DOES THIS YOU MUST CHARGE AFTER HIM AND LARD ON HIM!
 AND PRINT WIF YOU LAN BO THIS YOU HAVE RNOTHER 30
                                                                                                                    SECONDS TO "MUNCH" -UME HUR
 JAB PRINT" MHONEYER HE IS ONLY LUNINGUS FOR B SPACE OF 10 SECONDS-50 BE OUTCOLD
  190 PFINT" MERSPERS BISPACE W FOR MORE. "
 1020 PRINT"MR MOVING"
 1048 PRINT MYOU ARE REFRESENTED BY REVERRE
1050 FRINT STHE "PHAITUM" IS SHOWN AS A MASH "#" "
1860 FRINT SMITHE KEY FOR DUVENENT HRE!
 1878 PRINT" ARRESPERATOR PROPERTY -UF
 1959 PRINT "SPONSOND PREPROMES - DOWN
1999 PRINT 'INTERNATIONAL PROPERTY IN STATE OF S
1100 PRINT"PREPERELEFT-4 +"
1110 PRINT' SERBISHER
                                           PREES WASPROL . TO CONT.
:140 PRINT" SO READY TO PLAY "
1368 PRINT"MON YOU REE BEADY TO PLAY PULKNAN "
. 78 PRINT "MYOUR SCORE WILL BE GIVEN TO YOU AT THE END OF THE GHOE."
.180 FPINT"BH GOOD SCURL (TO BE PROUD OF) IS 150ROF"
130 FRINT BAND FINALLY IF YOU CLEAP THE MAZE IT
1_00 PRINT" LESS TIME TO MOVE"
1-18 PRINT MATCH OUT FOR THE PHRUTON ! "
1.20 PPINT" MEM
                                                PRESZ # SPACE # 10 BEGIN.
1230 GETAS: IFAS CO " "THEN 12NA
```

THE VIC NEEDS VIC REVEALED

THE DEFINITIVE REFERENCE BOOK ON THE VIC SYSTEM FROM NICK HAMPSHIRE

Now available. Price £10.00 from Commodore dealers and bookshops. Nick Hampshire Publications, P.O. Box 13, Lysander Road, Yeovil, Somerset.

DOUBLE Cannon is a shoot-emup (or down) game for one or two players. A sharp eye is needed to judge when the rondomly moving target crosses the path of your laser cannon.

But you can't waste time waiting for the perfect shot, as the game is also timed. Yet, it is important that you not waste any shots, either, since your cannon has just enough energy for 20 shots.

20 Manus.

Included with the line listing are definitions of the major variables. Also, a line-by-line description of the main game loop is presented.

Pérhaps of interest to programmers is the movement of the target. The target location for the PLOT commands is X, Y. This is adjusted each move by the variable X and Y (line numbers 302, 307). For example: if X=30, Y=10, X |= 1 and Y |= 1, then offset line number 307 has been executed. X=31 and Y=11—so the target is moving down and to the tight.

When the target reaches the right edge of the acreen, XI will be changed to -XI (XI=-1), since in line 302 the test lor X greater than 57 is true. Now the value will decrease by one as Y increases — so the target will move down and to the left.

RIINS ON AN

DOUBLE

BY OAVID BOLKH

- 5 REM DAVE SONLKE COSSON, LA 6 REM DOUBLE CANHONS
- 10 BRAPHICS SISETCOLOR 0,6,7 20 SETCOLOR 2,4,7:SETCOLOR 4,15,8 100 COLOR 1:PLOT 8,3T:ORANTO 0,39 102 PLOT 9.32:ORANTO 2,39
- 104 PLOT 7T, 3T: ORANTO 79, 39 106 PLOT 70. 32: DRANTO 77, 39
- 110 X1=1:Y1=1 112 X=INT(RND(1):\$25):+25
- 114 Y=1NT(RND(1) 8T5)+3
- 119 PRINT T20 PRINT * LEFT press I , and RIG
- HT M " T22 PRINT "Each side has 20 shots, sho
- wn in BLUE" 124 PRINT "HITS are displayed in RED.
- 126 PRINT "Time Teft is indicated in B
- REEN. "; 150 PLOT 9,39:0RANTO 31,39 TS2 PLOT 9,37:0RANTO 31,37
- 154 PLOT 9,38:PLOT 31,38 160 PLOT 69.39:ORANTO 47.39
- 160 PLOT 69,37:URANTO 47,37
- T64 PLOT 69,38:PLOT 47,30 L70 LH=9:RN=69:LS=10:RS=60:T=32
- 172 COLOR 2:PLOT 3T, 3T: ORANTO 47, 3T 174 PLOT 31, 33: ORANTO 47, 33
 - P.27 33, 3548410 47,33

- 176 PLOT 31,32:PLOT 47,32 200 COLOR 3:50500 900
- 202 P=PEEK(764):PBKE 764,0 220 IF P()23 THEM 250
- 221 SETCOLOR 4,7,8:IF LS>30 THEN 290 222 COLOR 2:PLOT 1,39:DRANTO 40,0 223 GUSUR 850
- 224 PLDT LS,38:LS=LS+I 225 H=40-1-Y:IF (H)D) AND IN(4) THEN C 0LDM 3:PLDT LH,35:LH=LH+2:RDSUB 060
- OLDM 3:PLDT LH,35:LH=LH+2:GDSWD 060 245 CDLGM 4:PLDT T,39:ORANTO 40,0:GDTD 290 250 IF PC337 THEN 290
 - 251 SETCOLOR 4,7,8:1F RS<48 THEM 290 251 SETCOLOR 4,7,8:1F RS<48 THEM 290 252 COLOR 21PLOT 78,39:0RANTO 39,0 253 605U0 850
 - 254 PLOT RS,30:RS=R8-1 255 H=41-X+Y:IF (H>D) AND (H(4) THEN C
 - OLOR 3:PLOT RW, 35:RM=RH-2:605U0 860 288 COLOR 4:PLOT 70, 39:BRANTO 39,0
 - 290 1F (LS)3D) AND (RS(48) THEN BOO 296 EF T>45 THEN 800
 - 296 EF T>43 THEN 800 300 COLOR 4:EOSUB 900
 - 30T BETCOLOR 4,15,8 302 TF (1)57) OR (X<22) TMEM 1T=-11:FO R I=I TO T5:SOUND 0,1+Y,T0,71NEXT T
 - 305 IF (Y(L) DR (Y)20) THEN YT=-YT:T=T +0.5:FOR I=1 TO 15:S0LMD 0,1+Y,10,7:ME BT I
 - 17 I 307 1=1+11:Y=Y+Y1 309 COLOR 3:PLOT T,32
 - 320 1F T)45 THEN BOD 330 SOUND 0,0,0,0
 - 350 E0TO 200 599 EDTD 599
 - 800 PRINT :PRINT "PRESS RETURN for a ext game ? "g
 - ETC game 7 -7 BTO P=PEEK(764):1F P=12 THEN RUM D15 SOUND 0.RHD(110250,TO,7
 - 820 EDTO R10 850 FDR I=1 TD X+TD:SDUMD 0,1,T0,TT
 - B52 NEXT TESDUNG 0,0,0,01RETURN
 - 060 SETCOLOR 4,3,9:FOR 3=TO TO T90 864 SOUND 0,3,T2,9:NEST J
 - 868 COLOR 4:80SUE 900 870 X=TNT (RMO(T) 425)+25
 - 070 X=TNT(RNO(T) \$25)+25 872 Y=LNT(RNO(T) \$T5}+5
 - 878 RETURN 900 PLDT 1+T, Y:PLDT 1+2, Y+T:PLDT X, Y+T 904 PLDT X+1, Y+2:PLDT 1+1, T+1: RETURN

ATARI IN 8K

Punhmion Terry Rugera

RHINS ON AN

APPI F.IN-16K

OU have been chosen as the best pilot for the job. only the job looke very bad indeed. You have to lity and cheed of your mother ship and blast a post through a severe meteor storm.

This is also a paying proposition. You are given points (the monetury system is in pointe) for just staying alive by dodging the meteors. If you don't want to make your first million within your own lifetime, then just

dodge.

Godge.

July each meteor you destroy you get 100 points When the situation gets very dangerous, you can go min hyperspose. I must warm you to use this as lew times as possible because you could come out of hyperspoce right on top of a meteor, or be hopplessly lost in space. Within a short time, however, you meteors with the best of them.

Now for the variable list:

AS- Used for temporary storage of INKEYS and used all over.

ES- this is what your shot looks like
G. This is the PRINT at location of your shot. If it is zero, then you aren't shooting.

HP - High ecore

HP\$ - The name of the high scarer.

I - Used for FOR-NEXT timer loops

L - The location of your ship in video

P - temporary storage for PEEK (14400).

PO - Your score. S - PRINT at location of the ship. S1, S2, S3 - PHINT at location of

debris. S\$ - This is what your ship looks like. S1\$, S2\$, S3\$ - What the debris looks

T. Used for FOR-NEXT timer loops.
YS. Used to ask, "DO YOU WANT TO
TRY ANOTHER MISSION?"

New to explain myself a little. First, the whole secret to the game is the screen's scrolling ability. When the screen is made to scroll, everything on it seems to go flying post. That is the way I made such a last game with such a small comount of typing

This, however, is the most useful technique I have lound. You may have seen a table that has the

keyboard memory on it.
Actually, there is no real memory

between location 14336 and 15359.

It is a bunch of switches that were mapped into a place in memory.

The author, Mr Harper, saye he

The author, Mr Harper, says he encourages people to edit the day-lights out of his program. So if you think you can make Meteor Storin a better game to play, leef free.

BY ROY HARPER







```
.
```

```
926 GOTO 748
 280 REM - Main Game
                                                                          938 DRTH 58, 100, 150, 200, 300
 318 F=F-1 IF F(-0 THEN G03UB 1889
                                                                          970 FL=FL+1 POKÉ PZ,128 PZ=PZ+1
980 GOTO 740
 338 IF PEEK (3875 a66 THEN XEX-1
 340 IF PEEK (3076)=64 THEN Y=Y+1
                                                                          998 REM - Fire1 Check
340 IF PEEK (3876)=64 THEN Y=741
350 IF PEEK (3877)=64 THEN b=441
360 IF PEEK (3879)=16 THEN CK=1
370 IF PEEK (3879)=8 THEN CK=2
380 IF KK2 THEN X=2
390 IF X47 THEN X=47
                                                                         1000 FL=FL-1 F=50 PZ=PZ-1 PGVE P7 32
                                                                         1838 GOSUB 1460 SCPEEN 1",4
1848 PRINT"++ OUT OF FUEL ++*
1858 GOTO 1388
400 IF Y>14 THEN Y=14
418 IF YC2 THEN YH2
410 IF YCZ THEN YWZ
420 POKE W.32 POKE W-1.32 POKE W+1 32
430 PRINT IF CR=1 THEN 1070
440 IF CR=2 THEN PRINT
                                                                         1072 FOR T=1 TO 3 PESTORE 1110 FOP I=: *)
456 Pw1993+X+Y864
450 IF PEEK (P)=255 THEN CRT1
470 IF PEEK (P)=255 THEN CR=1
490 IF PEEK (P)=160 THEN 1130
493 POKE P,170 FDKE P-1,92 POKE P+1,47
500 IF PEEK (3000)=16 THEN GOSUB 690
                                                                         1120 REM - Surer Gravity Force Field
1130 FOR T=1 TO 5 CHa64
                                                                         1150 POKE P-63 CH - POKE PAS CH
538 IF RMD(1)(,9 THEN POKE 2954+FNk(%),255
540 IF RND/1>>,1 THEN 600
                                                                             RUNS ON A NASCOM II
560 FOR Vel TO PHIRESD ON NEXT
590 REM ~ Detect & Set UP Gray Fonce-Field
                                                                               JITH GRAPHICS ROM IN 5 54
620 IFK=16 THEN K=0.FOKE 3018,184 POKE 3036-184
                                                                           PRODUCED FOR COMPUTER AND
638 GOTO 398
640 IF RND(1) X.95 THEN 300
660 FOKE 3016.185 FOKE 3036,185
670 GOTO 300
                                                                         VIDEO GAMES BY FUTURA SOFTWAR
698 REM - Fire Laser Gun
698 FOR I=1 TO 6
700 L=P+1*64 IF L>3001 THEN 740
710 PK*PEEK (L>-IF PK<>32 THEN 810
720 PCKE L-148
750 FOR J=1 TO ST
788 NEXT
899 REM - Laser Hit.
848 POKE L, 42
850 RESTORE 930 RN=FN9(3 -
860 FOR T=1 TO RN RESD SC-NEXT
880 S#=STP#(SC)*FOR T=1 TO LENKS#
890 POKE L-3+T ASC(MID#/S# T.1); NEXT
900 S#=STR#/TC) FOR T=1 TO LEN(S#)
```



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small room Penodically, a ranitor

lobs a hand-grenade through the window of your locked door. What

you do next could mean survival and

190 1F CHe64 THEN CHe32: COTO 1148 1200 NEXT N=2 GOTO 1220

1010 REM - End Game

1230 SCREEN 16 3-PRINT"-- RTTRCK OVER --"
1240 IF NK)1 THEN 1278
1250 SCREEN 11,5

1268 PRINT"* Crashed into Guildings | *" 1278 TE NO2 THEN 1388

1290 PRINT"Trapped by Granity Force-Field :" 1300 RC=0 IF TC<100 THEN RC=1

1310 SCREEN 14+RC, 7

1320 PRINT"YOU scored"TC"Feints."

1358 SCREEN 4. 9 PRINT"This is the Highest " 1360 PRINT"recorded acore so fart" GOTO 1398 1978 SCREEN A. 9. PRINT"The Highest recorded ".

1990 PKIN: "SCORE 15" TS 1990 SCREEN14.13 PRINT"Amother Game (Y or H) ?" 1400 R=USR(8): IF A=0 TNEN 1400 1410 IF R=09 THEN 1960

1429 IF 8=70 THEN 1440 1438 GOTO 1488

1440 CLS:PRINT"Nore you enjoyed the Game!"

1450 FND 1450 END 1460 REM - Claer 15 Line Screen 1470 FOP I=1 TC 15 SCREEN 1-1 1480 PRINT CHR#<27 >= NEXT

1490 RETURN 1500 REM - Pause For Key Press

1510 SCREEN 11, 14 1520 PRINT'S Hit and key to continue *"

1548 A-USR(0) IF ACOU THEN RETURN 1550 NEXT

1568 SCREEN 11,14:PRINT CHR#(27) 1528 FOR 1=1 TO 200

INDE COLUMN THE BOYS THEN PETURN 598 NEXT

1610 REM - Instructions

1638 PRINT" As you go speeding across the surfa

1640 PRINT"allen Planet in your laser equipped anti yrav." 1650 PRINT'sir car the loca is to wreak as much

1660 PRINT"destruction on the city below you as

1679 PRINT' You steen your craft " / by using 1688 POKE 2339, 178

1698 PRINT"cursor arrow keys to the your laser" ' and fire

your (aser 1700 POKE 2397.13 POKE 2401.11 POKE 2403.9 1710 PRINT'9un by Pressing the \SPACE-BAR'." 1729 PRINT' Your craft also has two selectable

1739 PRINT'Press '1' for hormal attack speed an

1749 PRINT"super fast 'ZuPe' drive."

1758 PRINT" Ala for the strategic targets ' a

1768 PRKE 2738.7 POKE 2738.14 1770 PRINT"score Points (58~300).

1700 GOSUS 1500 GOSUS 1460 1798 SCREEN 1, 1 1988 PRINT" You have a limited fuel supply, but

1818 PRINT"Sain extra by alming for the sPecial

1820 PRINT supply targets . '. Your ship can ho 1838 POKE 2282, 186

1848 PRINT mum of 18 units as shown on the fuel DBUSP ' 1858 PRKF 2294, 128 1868 PRINT" Your attack will end if you either

1878 PRINT"fuel, or fail to avoid one of the on -com1 n9" 1080 PRINT"city buildings . . . POKE 2458,255 1898 PRINT" Riso beware of the invisible super

900 PRINT force fields, your indicators . ' wi 11 11ght

1: 11975 1910 POKE 2501:184 1920 PRINT up " ' when you are serrosching on.,

1930 POKÉ 2638,185 1948 SCREEN 16, 12 PRINT Happy Manauding I'm 1958 GOSUB 1500

1958 GOSLIB 1468 1978 REM - Start Messages & Set us 1988 F=58:FL=18:CR=8:K=8:SC=8:TC=8

1990 POKE 3018, 184 POKE 3036, 184

1998 PURE 30:0104 PURE 30:01104 2000 TS="Points Fiet" 2010 FOR T=1 TO LENCTS: 2020 POKE 3037+T, RSC(MID*(T\$,T,1)):NEXT 2020 RZ=3055:FOR I=1 TO FL

2840 POKE RZ+1.129 NEXT : PZ=RZ+1 2050 SCREEN 15.5 PRINT"ATTACK Mode Selected" 2050 SCREEN 17.7 PRINT"ALL Systems GO !" 2070 FOR Tal TO 1020 NEXT RM=500 SCREEN 1.9

2000 FOR I=1 TO 9 PRINT TAB(22) GO (2090 RM-RM/1.5 FOR "=1 TO RM NEXT

2188 NEXT | G0T0 268

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sinclai

Play around with your Sinclair ZX811 Computer and Video Games proudly presents tour 1K games thought up end put into print by some of our readers. Enjoy the thrills of a road race, take part in a ski speciacular, blost iritle green men as they invade the galaxy and try and avoid the deadty projectile. It's over to you . . .

Test your skills on the ski-slopes with this program which

can be modified to give two other games. The object is to steer a skier through es meny sletom gates as possible. Press Q to turn left, P to lurn right,

By chenging a couple of lines slightly this name can bo changed to "RACER" viz:-Channe these lines to the following.

120 IF W = 4 THEN LET T = T+1 130 PRINT AT 3, M. "X"

170 IF T = 80 THEN STOP 100 IF W = 5 THEN LET W = 1

All other lines stay the some Dy changing the "RACER" listing still further we get "WORMHOLE", Keep the worm in his hole.

10 48 60 IF X 50 THEN LET 0 = 0 + 1 70 IF X 50 THEN LET Q = Q - 1 100 PRINT TAR C - BXX 118 120 130 PRINT AT 10.M "V" 170 100

All other lines tho same.

I have used the overgrinted X to represent a hatt-tone souare, i.e. CHRS 8.

```
##1
0=10
M=15
T=1
```



EARTH VS THE FLYING SAUCERS

An investor tient of fiving saucers is sweeping down on Earth and only you - the priot of a jet lighter - stand in their way. The ref highler appears on the left side of the screen and can be moved up and down using the keys 1 and A. The P key controls your air to air missiles

```
B=10
C=PI-PI
          LET S±C
GOTO 170
PRINT AT B,D;" -
LET D=D+A
IF B=F AND D=29 THEN GOTO B
                  D 0 30 THEN SOTO 90
          LET D=3

CLST=C THEN COTO 600

IF INT AT F CS ... (0)."

PF INKEY$=.1' THEN GO

IF INKEY$=."P" THEN GO

IF INKEY$=."P" THEN GO

IF INKEY$=."P" THEN GO
          GOTO 140
LET B=B-R
IF 5 CC THEN LET 5=C
GOTO 140
215
         SEB+R
10 140
LET F=INT
LET T=T
GOTO
                                       (AND +15)
         GOTO 400
                                   F, 28; "500H"
```

510 PAINT 5; " FLYING SAUCERS DE STROYED"



GRAND PRO

Take to the race track in this name of driving skill. The program simulates a track with randomly placed obstacles. Untortunately due to the limited memory nothing hannens if the player crashes into one of those, so a mental note should be taken of the number of obstacles hit and an extra tive points added at the end for each collision

When you have successfully completed the course the gamo ands and the time you took to cover the distance is chown

The car accelerates when key six is pressed and is steered by using keys live and eight.

BY JEREMY YOUNGMAN

```
1993
                   HRITTEN BY J.S.YOUNGHAN
          LET B=5
LET T=0
LET R=1
SCROLL
PAINT H
PRINT AL
                    T=0
R=INT
    49
                                  (AND #8) +2
    5070
                                 INKEYS=
                                                  "8") - (TNKEY
$="5"
          )
LET A=A+(INKEY$="6")
PRINT AT A-8;"
IF 8:1 OR 8:8 THEN GOTO 180
IF A=21 THEN GOTO 170
LET T=T+1
IF INT (T/2) +2=T THEN GOTO
 140
          PAINT
                                A, 2; " *BANG * "
 150
170
180
190
195
200
          GOTO 180
PRINT AT
                        AT 21,1; "#FINISH
AT 11,15; "TIME;"
32768
          CLS
```

THE PROJECTILE

In this game the player has to avoid a self culding projectile while attempting to reach home base.

The object of the game is to move from the top corner of the screen to the bottom - without getting hit by the projectife. To make the game more difficult simply use a 15 by 15 array. To move your man up and down use the V and N keys, to move left and moht use B and M. Another way to altor the difficulty of the name is to change the 4 lines 70-100.

BY J. SOUTHWARD

```
"AVOID THE PROJECTILE
     S PRINT "E HOUES YOU DOWN"

5 PRINT "E HOUES YOU DOWN"

5 PRINT "N H ARE THE SAHE ONL

FORWARDS NEU LINE"

7 INCUT US

6 PRINT SA 15, 15, "monHOHEmms"

7 LET FACE

8 LET SAC
    1024578
          30
          IF X (0)
IF Y+4 ()
IF Y+4)
IF X+A
IF X=A
IF X=A
GOTO 500
IF X=16
                                    LET
Y CET
                                                   TwT+1
                                                R=R+1
                         THEN
                                                        7+9>aT
                     500
  160
                            AND Y=15 THEN GOTO
1000
 200
300
400
          PRINT AT R,T;"M"
LET 5=S+1
GOTO 50
          CLS
PRINT "BOOM"
          PAUSE 10
          CLS
GOTO 2000
 540
1000
          CLS
PRINT "YOU HAVE ESCAPED"
LET 5=5+6
PAINT "YOUR SCORE IS "; S
```

ALL RUN IN 1K



MARTIN HURLEY

RUNS ON AN ATOM IN 2K

SLOWLY the creeping crawls toward you list 194 Nege make soft shad not sounds on it advances its many syes glean

malice as deadly verson um (T drips you its slavering mand Don't you just

Hore's your chance to he back at these nacty creatures The idea of this game is to sneak un on a solder and stomp on it. But your man must not stay near a spider for too long. The creatures can send a stream of deadly venom at your man killing him instantly if it strikes

The came ends when you have cone your mon will jump for Joy

ox when you have lost five men. The keys which control the

T to go up. V to go down. F to go

left. G to go right. Vto stamp. The variables gre: A position of spider. B: position of man-M. amount of men. T: spiders

killed. R: key pressed.

SPIDERMAN

XLIST 1P. 9421 BY MARTIN HURLEY" RINS IN 1868 BYTES" 10 3P. ' " HIT A KEY THEN YOU ARE REPOY", LI. MFRES

501M2-1; P, \$21; EJSRWFE71, STY#90, PTS, 3) P; \$6, P=#RRR2, T=R, R=9 1901 #ARB R=33883 B=32881 7B=#7F B7 128 B7 1=47 0731=47

118733=28,87-32=15 #0aLI.V. /R=7#80+1ER=255G.79

5278=32-8731=32-8733=32783-1=32 871=32,87-32=32 ERIFR-12R=8-32

641FR-388-B-1

561ER=398=8+1 681F84328918=8+32

691FB>38246B=8-32 7078=17 B71=28-87-1-47 B731=47 B733=28 B7-32=15 71 TER-445-h

1884-8-8-14-28-32 H/31-92 R733-32 R7-91-32 R7-33-38 R7-32 108235=32. PP4=32-4 2432 873+32

201PX=98=9+32 30-1FX=16=8-32 CONTENTION OF THE 1507EX=3814E

(M21PR)33244824-32 1541FR(32000R4R43

Bridg.

000 F. WELTON BY - 72 BY - 72

10 . DECK 090c0=A.R. K4±1-6.(0N0+3000) 0190=84.F. N=9103+A70=42A,G03.e. A70=32

0111FR749402>(>32 FNDAC(0+82)=645.0 0178=0+38 1- 51A

30200=-64, FI.N=0T03; 820=#24, G05.e/H70=32, 1021 (FA769-32)4732 ANDROLD 32)(1645. d 30220=0=92 Jentra

38380=-27F-W=0703, 870##287003, g, 870932 3031-1ER7(0-0-X732 RNDB240-37(90320=0-1:N +5.3

30400 - F. N-0103, 920-W287GUS, e. HT0+32 38411F82(0+2)()32 8ND87(0+2)()645(d

38420=0+1 N-16-8 4008dM-M-1; P. \$30"YOU LET HIM FILE YOU! "" "YOU HAVE "M" MEN LEFT

40050731=32 8730=32.071=32:8733=32:87 31=32.071=#68. 401070=#77:87-1=40.07-32=47.07-30=47.0 K=070600 7P#7P 4.N. 40201FM=0:PL \$12"ALL YOUR MEN ARE DERD" G.

4838G, 10

5000eF.N=0TD20, ?P=?P-4, N. :P. 6888FP. " "DD YOU WANT ANOTHER GRMECY OR NO ZH. W. IFW=Y.G. 5 6010E.

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COMPUTER & VIDEO GAMES 61

enjoy solving mazes? Well, this program will provide a different one each time it is run. Just watch the computer draw out a maze while you lry to work out the right path.

When the computer is linished drowing put that nlon into action - and do it through the maze ogainst

the clock The program is built on algorithm, which will produce a maze which has one. and only one, path from o cell - the little "rooms" which make up the maze to mother cell.

The algorithm is as lol-

1. Fill the maze with little cells, no one connected to cmy other (lines 40-80 in the

program)
2 Choose one ol them and call it the "mother cell" (line 95) It will be the "present position'

3 Record cells which gran't connected to any other cell and border on the present position (lines 100-140). 4 Il lhere are no such cells,

raturn to the previous position. If you can't do that, because you're in the mother cell, is the maze ready, (lines 150-160)

5. Choose randomly one of the recorded cells (line 180) 6. Connect that cell to the in that cell from where you connected it. (lines 190-220) 7. Move into that call. (lines 230,250)

8. Go to step 3. (line 270) Lines 1-3 show the control keys and must be omitted to make the program fil m 3K. Lines 12-30 iniliates the

screen (Poke 36879 salects -12 PRINTCHR\$(142)"78". lhs colour of the screen). Lines 1000-1035 make the entrance and the exit of the moze and set the time. Janes 1940-1100 are the race

part of the program. Lines 1110-1190 play a little 155 FORL #38488T038985 POKEL 7 NEXTL



MATS DEHRMAN

RUNS ON A VIC-20 IN 3-51

REMINIORSE DOWN TORSE UP MORSE LEFT HORSE RIGHT" 2 REM"RHOME TICLE MENST MOEL"

3 REM BLK WANT WEED LEVN SPUR MORN WELD THEL SEVS ON MPYS OFF" 5 REM '#######

10 REM 'MAGGAGGA MINGTHUR (C) 1982 F MATS CEHRMAN

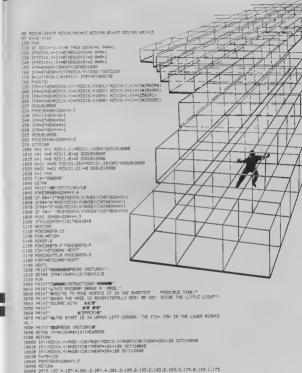
14 PDKE36879,25

15 INPUT "INSTRUCTIONS", A\$ IFLEFT\$ (A\$+"Y", 1) () "N"THEN GOSUB5888

28 POKE36879,93 38 PRINT "7" 48 XN=22 VM=21

58 DIMM2X(NM.YM),UX(3)

tune when you have 68 FORL=1T028 MZX(0,L)=18:MZX(XM,L)=18 NEYT L 78 FORL=1T021 MZX(L, 8)=5 MZX(L, 4M)=5 NEXT L



28818 DRTA 183.2,195.2,195.2,281.2,195.2,183.2,163.3,175.1,183.2,163.2,175.2,175

,2,163,6

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game It's addictive and fascinating and does terrible things to your telephone bill and spare time.

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asser

Dr. Ian Logar, winner of the 1981 Roselfa Stone Award has writte Three assential books for those who really want to indensional to full working of the SNCLAR 2081

Understanding Your ZXSI RON
Ints book P. opan gete a compile a verview of 250 machine
language using the ZSI manetar propiem as an example. Or
lapon explains the studies of the ZSIR ROM is poculations, and
lapon explains the studies of the ZSIR ROM is poculations, and
PLIS a special section which shows how you can explain as an explain a special section which shows how you can explain a special section which shows how you can explain a machine
laponer into your ZSIR by using machine income.

grance tables, etc

Remiflance enclosed ±

FROM TOP TO BOTTOM

Those of you who have ventured into the dark forest of Adventure programming and typed "LOOK AROUND" probably can't see the wood for the trees by now! So let's have a look at the structure of a complete program.

From top to bottom of the program, the following sequence shows how various blocks of code fit together.

 This block of code lays out the ground for the program to operate in:

CLEAR string space. (Allows manipulation of character strings) DEFINE variable types. (string, integer etc.)

DIMENSION arrays.

2. This block loads the framework of the plot READ in DATA or directly assign.

variables — or both.

3. Start of program loop. Communicate with the player:
Check for special conditions.

Clear screen.
PRINT display variables.
Reset screen variables to null.
Åwait INPUT.

 Interpret the player's communication with the computer. Decode verb and noun.
 If either are invalid singly or in combination set reply and return to block three.
 ELSE GOTO black five

5. Execute the plot:

This block comprises a number of routines, one to cover each valid velb. Each routine alters game variables, and sets reply variables, then returns to block three ar goes to block six for a standard reply.

Set standard replies. For example "IMPOSSIBLE" "OK".
 DATA statements to be read.

by block two.

Lot's have a look at block one
in some detail. Don't worry if
your computer doesn't have all of
these Basic statements — but
use them if it does!

Some machines require string space to be set aside, by the use of Clear nnnn.

This reserves the specified amount of memory for strings and string handling. If you have this feature I suggest you start by clearing about 1500 bytes and adjust by trial and error if you start running out.

If your game is approaching the capacity of the machine, you may have to strike quite a fine balance between string space and run-time memory.

Some machines allow ranges of variables to be defined at the beginning of the program by a DEFSTR statement. DEFSTR A for example would thereafter

cause any variable whose name begins with an A to be a string variable. This caves the memory requirement for the \$ sign. Similarly, DEFINT will define a variable range as integer.

Dimensioning arrays has already been covered — but a word of adviced Make sure the plot of your gome is thoroughly detailed before setting hands on the keyboard — or you will not only have to keep increasing your array dimensions, you will have to lengthen the loops that scan them — and you are BOUND to miss onel I know — I otherway do!

Now we can see the shape of the whole program, in the next issue I will start to examine more detailed parts of its logic.

SOING UNDERGROUND

I have been playing Absrsoft Adventurs supplied by Absrsoft of Dyfad, which tuns on a Sinclan ZX81 with 16X RAM pack

"Welcome to Advanturs proclaims a flickor-free screen an typing "RUN", and before long wa sre on the edge of a larest autside a

Further exploration leads us to e canyon, and eventuelly to a locked

Oh dear — you didn't bring this keys, did you? Never mind — I did, se down the gisting we go only to find ouselves in en oudergeaund world of coverns, low revisting pessages, end a vest chembar with an unclossable fiscore

We have collected an soutale small bild, a wicker case, and a black rad Hang about we've done this before beyon't wa?



Yes, for ell intents and purposes we could be inside e Pyremid of the Tendy veriaty For black rod lead scaptre, let small bird raid bird-stetue and for wicker cage read statue box.

Those of us who are well travelled new knew how to cross the fissure find torch batteries etc.

What I didn't mention whom I received the Tendy game is that Pyremid is itself an ebridged and modified version of the original Advantus.

So for sceptia teed wand Could be useful for there are things you would expect to do with a wend but not necessarily with a sceptie of

Although not an original plot, it has cartainly survived well! What's it like on a Sinclen? I found it typing apart — better than on a Tandy os the scienn is cleated rethan than acrolled, making it, for me anyway, less confusing

One small curricum is that the inventory is teat the inventory is tetained when the game is se-run Consequently you can give things, quil, and then chearl Nevertheirs, it is pleasing to see full size Adventures — in more terms — being made available to thousands of Sincheu owner.

My thenks to Mrs. Pam Bryen of Southlands School, New Romany, for the Joan of her computer for this

PRACTICALI **PROGRAMMING**

GRAPHIC GRAPHS...

Many home computers have a sophisticated set of graphics commands, and various dialects of BASIC provide features for the format of output, including cursor control characters and such commands as PRINT USING. PRINT AT. etc. However, it is possible to do a great deal with only the standard formatting features of comma and semicolon following the PRINT statement, and the TAB function.

Using the TAB function it is nossible to draw law resolution graphs: for example.:

100 FOR X = -1 TO 1 STEP

110 LET Y = X * X 120 PRINT TAB (Y * 40); " * "

will give a graph of the function $Y = X^2$ from X = -1 to

X = 1: while 100 FOR X = 0 TO 2 STEP

110 LET Y = X2

120 PRINT TAB (Y * 5): " *" will give a graph of the function $Y = X^3$ from X = 0 to X = 2

The reason for using Y * 40 and Y +5 is to provide a suitable scale for the graphs. The argument of the TAB function is required to be not greater than the number of columns on the screen; since X2 <=1 when X is between -1 and 1, and X³ <=8 when X is between 0 and 2, these values allow us to use the full width of a 40 column screen.

It is also possible to draw a graph of a function which takes negative values; lor example.

Y = SIN(X):

100 LET L = 2 * 3.14159 110 FOR X = 0 TO J, STEP 1/50 120 LET Y = SIN(X) 130 PRINT TAB (20 + 20 + Y):

140 NEXT X

Negative values will appear on the left of the screen and positive values on the right.

The most straight-forward use of the comma and semicolon in

PRINT statements is to produce columns of numbers, but there are problems when different numbers of digits are involved. For example:

100 FOR 1 = 1 TO 10 110 PRINT I; I*I; I*I*1*1

will give the result shown in table one, while replacing the semicolons with commas gives the slightly better, but still unsatislactory table two

We can use the TAB function to print the columns with the numbers right-justified: we need TAB(N) for one-digit numbers, TAB(N-1) for two-digit numbers. TAB(N-2) for three-digit numbers, etc. (i.e., we need TAB(N+1

number of digits), which leaves only the problem of finding the number of digits in each number to be printed. There is no simple way to do this, but the method I prefer is the following: 18 LET X = number to be

20 LET XS = STRS(X)

30 IET D = LEN(XS) 40 PRINT TAB(N+) -DE X i.e. convert the number to a string and then find the length of the string. The various operations can be combined into a PRINT TAB(N+1-LEN(STRS(X))): X

STRINGS AND THINGS...

One point that you need to watch when using STRS is the format of the resulting string. Some BASICs give a leading space in a positive number while others give only the digits. This method can be extended

to deal with decimals by replacing line 20 by LET X\$ = STR\$(INT(X)), or in the compacted expression PRINT TAB(N+1-LEN(STR\$(INT(X))); X. This allows you to print columns with the decimal point aligned vertically.

Another method for finding the number of digits is to use the expression D = 1 + 1NT(LOG(X)/ LOG(10)). There are several reasons why this is less satisfactory than using STR\$ and LEN. including its lack of obviousness and the practical reason that, due to rounding errors within the BASIC, it may give the wrong answer on numbers close to a power of 10.

COMPLICATED CALCIU ATIONS

A more complicated problem involving columns of numbers crises when we have amounts of money in pounds and pence which bave to be printed with exactly two digits after the decimal point; e.g., £1.30 rather than £1.3 or £2.00 rather than £2.

If the amounts are calculated by a method which does not necessarily produce an exact number of pence the answers must first be rounded. The standard method for rounding to two decimal places is:

X = 1NT(100 + X + .5)/100(rounding to the nearest penny) or X = 1NT(100 + X)/100

When we have the answer correct to two decimal places we cannot simply print it using one of the methods above, as trailing zeroes after the decimal point will not be printed by BASIC. and the decimal point will not be printed if the answer is an integer. To get around this we have to do a great deal of manipulation, separating pounds and pence, converting to strings. removing leading spaces put in by STR\$, making sure that there is always two digits in the pence, and finally putting everything back together.

100 LET X = amount in pounds,

to 2 decimal places 110 REM SEPARATE X INTO L

120 LET L = INT(X) 130 LET P = 100 *(X -L)

140 REM CONVERT FROM NUMERIC TO STRING 150 LET LS = STR\$(L)

160 LET PS = STR\$(P)

170 REM DELETE LEADING BY TED BALL

PRACTICAL PROGRAMMING

SPACES IF NECESSARY 180 IF LEFT\$(L\$,1) = " "

THEN LET L\$ = RIGHT\$(L\$, LEN(L\$)-1) 190 IF LEFT\$(P\$,1) = "" THEN LET P\$

RIGHTS(P\$.LEN(P\$)-1)
200 REM ADD LEADING ZERO
IF LESS THAN 10 PENCE

210 IF P<10 THEN P\$ = "0" + P\$

220 REM NOW BUILD UP FINAL STRING

230 LET A\$ = "E" + L\$ + "." + P\$ 240 REM PRINT ANSWER

COLUMN N 250 PRINT TAB(N+1-LEN(AS)): AS

ROUNDING ERRORS

I mentioned rounding and rounding errors dove, in passing, but this is a subject that deserves a closer examination. Many of the numbers we deal with are approximate, particularly numbers obtained by measurement, and we often have to round answers to a specified number of decimal places or a specified number of sunfficient figures.

There is a simple method for rounding to any specified number of decimal places, as described obove for the case of two decimal places, and the same method can class be used to round to any required degree of accuracy.

However, when using the INT function we must always watch out for differences between the decimal number that the computer prints on the scieen and the

	Table 2	2	
1	1	1	١
2	4	8	
3	9	27	
4	16	64	
5	25	125	
6	36	216	ı
7	49	343	
8	64	512	ı
9	81	729	ı
10	100	1000	

wer will come out as 1, as we expect, but internally the answer may be binary fraction .1111... to 24 or 32 places. The result of PRINT INT(5*(1/5)) would be 0 since the binary fraction is less than 1.

FINDING THE ANSWER . . .

In order to be sure that we get the right mswer we must add a small fraction to the computers answer, for example, when rounding an amount of money to the lower penny, if we use:

LET X = INT(100 * X)/100 due to binary decimal conversion, 100 * X may be 2-34 or 2 32

less than an integer and INT(100*X) would be one less than the correct amount.

If we do the rounding by:

LET X = INT(100 X + .0001)/100

we correct for the small stror



binary numbes which is held intenally and used in calculations. Just as some fractions do not have a decimal sepression to the law of the law

binary fraction is .010101...

The problem with INT arises when we have a fraction that has a finite decimal representation but an infinite binary represen-

For example, 1/5 can be exactly represented in decumal as 0.2, but in binary is .00110011... If we ask the computer to PRINT 5*(1/5) the ans-

introduced by binary/decimal conversion, although adding .0001 may sometimes introduce an error in the opposite direction.

A similar problem arises when making tests for equality. As in the example above, we may find that a number printed out as an integer is actually held internally as a fraction differing by a small amount from an integer.

The test IF X = 1 THEN . . . may give the wrong result although

PRINT X would give the answer 1. This can be allowed for by testing for the two numbers being close together rather than for them being equal, so was should write instead IF ABS(X-1) <1E-5 THEN...



ADVENTURE IN

Creators of Adventure games have yet to tap the full potential of graphics.

They can be used to model terrains which could be a bia advantage in such games. The terrain can provide opportunities for ambush and give a clear advantage to characters occupyand the heights. In general, graphics can provide many tocticol possibilities.

An important use of graphics has olways been to present information in such a way that it can be easily understood.

In this article we are going to start with a table of numerical data, and examine various ways of presenting this information graphically.

can be presented in the way shown in liquie one by drawing a curve using the data in each row of the table. Each curve gives a different cross-section of the surveyed region. This presentation is rather cluttered and does not really help one to visuglise the oppearance of the

Figure two shows the information presented as a contour map. This is a rather better presentution. It could be enhanced by using colours to shode the regions between contours as is done in the maps in on atlas.

However, it still does not give g visual impression of the appearance of the region. Its ellectiveness depends olmost entirely on whether the observer is familiar with the idea of o contour map.

A three-dimensional perspec-

Tabulated data of this kind rises in many problems and applications, and the graphical schniques that one illustrated see are widely applicable. For this reason, although a specific problem and some of the possible ways of presenting its solit or put for the problems of the problems of the problems of present interest and use. The following table gives the leights measured at each roses-point of a rectangular grid overing a particular site.			tive view of the surfoce is given in figure three, and of leaf we make it can be comediated. The opportunity of the control of				(DA)			
COI	LUMN				-		2	8	, ,	
ROW	1	2	3	4	2	0				
now.	1.2	1.0	0.8	0.6	0.6	0.4	D 2	0.2	/ ,	
2	2.1	1.8	1.5	1.6	2.2	19	1.0	0.8		
3	2.8	2.8	2.8	3.4	4.3	38	26	23	- 2	
- 6	3.3	3.5	4.2	5.8	8 2 5 6	9 2 5 3	6.3	40		
5	3.9	4.2	4.6	5.5	5 B	5.5	4.5	4.6		
	5 1 6 0	5.3	5 9 6 8	62	8.0	5.8	5.5	5.4		
0					0.0					
7	61	6.2	6.4	6.6		6.2		5.6	EXDAM 4	

an official survey or fro surements made in my garden. They could be used to model the terrain that was surveyed, but the data could equally well be used to provide the field of oper-

ations for an Adventure game. The information in the table visual impression of the surface of the region.

An ideal presentation of the data might consist of a combination of methods. Using both a three-dimensional perspective and a contour map, the details hidden line removal in the 3D presentation can be deduced from the contour map. Alternatively, a series of threedimensional perspective from different viewpoints moy prove to be most useful



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The same of Ragear the pirate and his star troopers must now be heared in this sector of the galaxy. Nice anemy worlde have I plusdered in the lost parsec-twer of thase for the first time.

The invector of Strate's ereptre is going strongly. She puts up so little resistance that I will pull out hell of the affacking force to plan so esseult

My lame merchest Epplen is fransferring realeriels so last as his Beet can sed I know he exact the business so he is so threat for the

manusi.
Chose the Serzerier and his many retols have proved leithful allies throughout the game which reable them a perfect tergal! And as Chias result be thinking the same third allies him sow. And a small whose results have been applicated those two explorer ships I want out. ??

The late night caller identifies himself: "This is Space Pirate Tharg. Unless you start delivering raw materials to me as from the next turn I'm going to plunder your home world."

He hangs up abruptly, leaving you to wonder; Can Tharg really be serious? How does he expect me to react? Was it even Tharg

at all?

Hard to imagine a computer being involved in this kind of duplicity but this is an example of the kind of play you have to guard against in the still relatively undiscovered field of computer moderated gaming.

The best established of these games is Starweb, run in the U.K. by Chris Harvey, who has a host of horror stores similar to the above of murderous bersers claiming to be merchants to dupe the unwary; of players tricked into forfeiling their next rum; and ottackers who, in midroslaught, realise they have been fed the wrong map information.

Anything goes and you have to be prepared to face opponents who will stop just this side of the law-of-the-land to achieve their ends. Threats, broken alliances, libel, lies and downright sneokness, form the fabric of these games, some of which consider 18 months o good life soon—others go on indefinitely.

A computer program is used to map out a world, galaxy or even universe and the rules and aims



of its races and inhabitants. The game is then peopled by players, who take charge of tribes, nations or whole solar systems and then plan their

campaigns for mastery.

Starweb, via the U.S. firm, Flying Buffalo, is a good example.

Players choose a racial type

Players choose a racial type for themselves. There are six: Pirates, Berserkers, Empire Builders, Merchents, Artifact Collectors, and Apostles. Each type has his own special powers, amis and victory conditions. As he fulfills these conditions, he is awarded points.

Enough players to achieve a good game — (between 10 and 15) - strive for a points total chosen by averaging out each player's suggested winning

Apostles try to convert worlds, Empire Builders attempt to own worlds, Berserkers aim to destroy life, Pirates seek to plunder planets, while the popular Merchants ship much-needed raw materials and Artifact Collectors hope to gather rarities

It's a combination of characters which ensures plenty of rivalry and conflict but also demands interaction, reliance on other players and usually results in some unholy alliances.

The player is placed on his home worlds, given ships and forces as befits his role and embarks on his quest by sonding off a letter detailing his orders. In the case of Starweb these are sent to an old mointrame computer — a Raytheon — in Americo to be processed and then returned with a printout of how the universe is developing before each player's eyes. What his exploration ships have discovered and whether any contacts have been made. Turn-tacts have been made. Turn-

around is four weeks.
Other races—players—are
usually contacted around turn
three and then the "diploming"
side of the game begins, with a
player sending off a card to a
whoever ambushed his smoll
fleet on the outer edges of his
realm. This card will usually
include a phone number and
suggest a meeting of minds.

Swopping any information with fellow players helps to increase your understanding of the universe.

The game scores over more orthodox wargames, firstly because fellow enthusiosts are found for you and secondly, because there is a greater sense of realism. You can't see your opponent secretly massing his forces on your border and you don't know what is lurking beyond what you know explored.

You only have a player's word about his strength, race characteristics and intentions – so just how for do you trust a space pirate? According to enthusiast Kim Bailey, honesty is the best policy because those who lie are usually caught out and never trusted again.

Diploming is the most important part of the game. Being able to persuade others that it is in their interests to do what you want them to is the mark of a good player.

Occasionally you come across a player who will not talk and these, according to top player Bob Brown are the first to go:

They are an unknown quantity and that alone forces you to attack them."

It is difficult to estimate how many Starweb players there are in the U.K. as many play several games at once but it is in the region of 250+.

The U.K. end is run from P.O. Box 100, Bath Street, Walsall,

West Midlands. Starweb costs E1.50 per turn. Other Flying Buffalo games which have a following over here are: Nuclear Destruction, 50p; Battle Plan £1.00; and Space

Bottle, from 75p.

The only all-British game is Mike Singleton's Startlord which he wrote on his 32K Pet and began running in April 1981. It now has 300 players and allows up to 50 to compete in each

game.

This game is designed to run indefinitely. Players aim to become Startord Emperor and take their seat in the Throne Star of the centre of the Galaxy. The seward for this is free turns while Emperor, a complete principal many of the Empry which is tetches across a whole galaxy and control of any surviving Empry amendation.

Players start with a command ship, a bose star and a fleet of 50 starships. The command ship has no fighting power but is a communications centre and the player's control is limited to seven astrals around this ship.

All the stars have a name and there are 14 types in this galaxy, including: signal stars, for galactic news; power stars, for fuel; gate and exit stars, for spoce jumps; city stars; battle stars and fort stars.

Battles are resolved by the computer, comparing each commander's battle orders, retreat threshold and ratio of lones on either side.

Starlord boasts a two weekly turnaround and costs £1.25 per turn. But the real measure of its success, is that America, the real

home of this form of gaming, is keen to import Starlord under licence. Mike Singleton claims proudly: "We are negotioting with three American firms. It's a bit like selling coals to Newcattle." Mike is at I Rake Hey Close, Moreton, Wirrall, Merseytide.

Tribes of Crane is a computer assisted game with record storage and word processing performed by computer. This is set on the fantosy world of Crane and features the warring tribes of that nation.

Players take the part of a chief of one of the wandering tribes and their aim is to lead their people to dominance over the neighbouring tribes. Each tribe has its own way of measuring prosperity and so obtain points.

The game runs indefinitely and can be entered at any time and the faminsy world has a complete range of geography, ranging from desert to polar ize, with mountains, rivers and forests. Cities close form port of the world of Crane and act are centres of trade and homes for the land's powerful lords and shormans.

snamans.

In a standard standa

The game is run in the U.K. by Mark Blundell and costs 85.9 for the first four turns. The price includes a rule book — pluyers have to pay \$1.50 per turn often than the rule for the way that the proper have to pay \$1.50 per turn often than the rule for the rule for

Prehips the best recommendation for computer moderated gaming is the players themselves. The four I telephoned come from very different parts of the country but — with one exception — they all either knew or had heard of one another by reputation. A very good way of contacting fellow games enthusiants.

 If the idea of computer moderated games appeals to you, Starweb's U.K. agent is offering the chance to play it for free through the magazine. Turn to page 15 for further details.

DOWN TO

SINCLAIR BASIC

The computer language BASIC fails to live up to its simple label in one major way. There is a variety of different versions of the language with each microcomputer manufacturer adding their own extras.

Unfortunctely, this makes life difficult for the programmer transferring from one machine to conther. To try and help you over this burdle from now on, I will include a toble summerising the main features of the version of BASIC available on one of the popular microcomputers. I start with the Sinchitz XS.81.

As f will continue to cover the general features of BASIC in parallel with the production of these tables, it is inevitable that they will include statements that if have not yet covered. You should use the tables for general reference.

Variables Names of numeric variables may be of any length and consist of any combination of letters and digits provided they start with a lefter. The name of a control variable to a FOR NEXT loop must be a single letter. The name of a string variable must be a specie teller inflowed by S. Arrays The name of an array must be a single letter fellowed by \$ rf Il is a string array. Arrays may be of any size and any number of dimensions. Fer a sleing array the length of the strings must be specified in a DIM statement a n NiM NS(10 5) sats up a list of 10 shines each of length 5. Substrines can be used e.q. (with above defined list: NS(2,1) refers to the 1st character in the 2nd string of list NS NS(4, 3 TO 5) refers to characlars 3-5 of the 4th sinne. Slatements No END stalement. The

Them et the IF statement is <ine no. > IF <cendition > THEN <state ment > CLEAR, deletes all variables. CLS, clears the display. FAST, increases speed et calculation, but affects the display. PAUSE, can intro-

duce a pause in computing until a key is pressed or for a fixed time (if specified). POKE, writes specified value all specified memory address. SCROLL, scrolts the display up one line. SLOW, puts the computer in display mode.

Functions ACS, arccosine, ASN, arc sine. CHRS, converts cade number to character. COOE, cenverts character (flist in specified string) la cade na number. INKEYS, reads character pressed en keybeard. LN, natural legarithm. PEEK, value of byle in specified memory address address in range 0 to 65535, Pt. value of II. STRS converts number to character string of digits, TAN, Jangent, USR, calls machine code subroutine with specified start address. VAL. treats specified string as an authmetic expression. Plus ABS. ATN. COS. EXP. INT. LEN. RND. SGN. SOR. SIN. Granhies Screen has 22 rows and 32 columns. PLOT X,Y "blacks in" screen position row X, column Y UNPLOT X, Y "blanks" screen pesilren low X. celumn Y. Graphics characters.

NOT SO SIMPLE

As the programs that you write become more complex and langer, you will face two main problems.

You will find yourself having to repeat groups of instructions at several points in your program. These groups of instructions may be identical or very similar.

Another problem is that the

increase in the length of your programs makes it more difficult for you to keep track of what is going on in your program. The unfortunate consequences

The unfortunate consequences of this are that you will tend to make more mistakes in developing and typing in the program, and that the errors will be more difficult to track down.

The use of SUBROUTINES can

help alleviate both these problems.

BASIC contains the facility whereby a sequence of instructions which is to be executed at several points in a program need



only be written once. These instructions form a subroulme. Each time the subroutine is to be executed it may be entered by means of a GOSUB statement.
The general form of a GOSUB

statement is
<statement no. > GOSUB
<statement >

<statement > for example;

20 GOSUB 400
As you can see, the form of the GOSUB statement is very similar

to that of the GOTO statement. The operation of the GOSUB statement is in fact similar to that of the GOTO statement in that control will be transferred to the statement specified. In the above example, control will be transferred to statement 400.

However, with the GOSUB statement, a note is made of the current statement number before the specified jump takes place. It is then possible to return after the subroutine bas been executed. With the GOTO statement, there is no record of where you jumped from.

in BASIC, a subroutine is actually no different from any other group of statements in a program except that there will be a RETURN statement at the end of the group. It is when this RETURN statement is encountered that the computer transfers to where the previous jump occurred.

The RETURN statement takes the form

<statement no. > RETURN
for example

DOWN TO

450 RETURN

After the return is made, the statement after the GOSUB statement will be executed.

Usually, subroutines are included at the end of a BASIC program. A program containing one subroutine could therefore

ake the general form
10
20
40 GOSUB 400
50
70 GOSUB 400
80 —————
90 —————
100 STOP
110 REM
410 REM SUBROUTINE
420 REM
430
440
450 RETURN

THE NEED FOR COMMENTS . . .

460 REM*******

Two main points arise from the above example.

As stated previously, the only factors that distinguish a subroutine from any other section of code is that it has a RETURN statement at the end, and it has corresponding GOSUB statements. There is nothing in the mechanism for setting them up that clearly indicates the beginning of a subroutine and the task it performs. I have emphasised

the need for comments in your program before, it is vital when using subroutnes that, at the very legst, you include a comment at the hearinning of the subroutine

In line 100 of the program there is a STOP statement. This causes the execution of the program to be stopped when it is reached. It is possible to have a number of STOP statements at various points in a program providing alternative stapping points.

SUBROUTINES AND LOGIC



The reason for the inclusion of a STOP statement in line 100 of the above example, is to prevent the computer automatically proceeding sequentially from and through the subroutine. As a general rule, there should always be either a STOP statement or a GOTO statement immediately before a sub-

Subroutines are also used to split a pragram into logical sections - where each section can be developed and tested as a single unit Ideally each logical section should be no longer than a page in length so that they remain easy to read and understand

This may be achieved by further dividing large subroutines into logical sections some of which will themselves be subroutmes. In this way, you can have nesting of subroutines.

NEXT MONTH

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SCREWDRIVERS AND SPANNERS

It would be nice, I keep telling myself, if I could carry on me every single piece of electronic equipment I was ever going to need. I tried once but my pockets split. Now all I carry around is a small neon screwdriver and a penkinte, with which I can get most pieces of domestic equipment installed or temporarily reported.

Of course, for construction, as well as for the majority of repoir jobs you will need quite a few more pieces of equipment — and these I will cover here.

Before I start there are a number of important points to remember The first, which is a rule of thumb I always employ, is to buy the best you can offord. Secondly, and almost as important, don't waste money buying something you will not use or which you could do without.

The last point is to find out which model is right for you by reading through the catalogues and trying out the equipment in the shops. This especially applies to soldering irons.

Now, down to the tools. I will start, as I bare just mentioned them, with soldering irons. There are two main types—uncontrolled mains heated and temperature controlled, either mains or low voltage AC or DC. Whitebever one you get you.

will be able to undertake the same work. Buy an rron with interchangeable bits, and get a spore one to go with it. You should have one small—one to 2mm—and one medium—2 to

The names to look out for are-Adooia, Antex, Erasa, Oryx, and Weller for mains uncontrolled and add Ungar to the list for controlled froms. Prices range from \$1.2 to \$4.00 for mains and from \$1.2 to \$4.00 for contolled. An iron should lost a lifetime, only the bits need be changed.

You can't really go wrong with solder, but having said that do not buy acid flux type. Use 60:40, tin/lead in 22swg, which is generally available. To unsolder use desoldering braid, it is easier



and cheaper than a solder sucker. I have found Multicore Solder Wick to be the best although there are other makers such as Spirig and WiK.IT. The worst, without a doubt, is the one made by RS Components.

Next on the list are pilers and cutiers. These can be bought separately or as a set. Either way will do. Find the ones which suit wou best by trying them out.

suit you best by trying them out. The pliers should be pointed nose with either plain or serroted jews. The culters ought to be lightweight, either side of diagonal cutting for the best results. Manufacturers include Arioso, Barco, CK, EPE Corporation, Erim, Lindstrom Proto, Willeston and Keeller. The process range from £2 to £8 for pliers and from £4 to £15 for cutters.

For cutting heavier guage wire and pins if suggest a purpose built cutter and stripper as the light cutters can easily be damaged on the harder materials. Prices range from \$1.50 to \$5.00 and most are usually good value, and most of the makers of pilers and cutters produce these.

It is most important to buy the best when it comes to screw-drivers Sets are too expensive and usually contain too many sizes. Changeable blades are a waste of time in my opinion, if you are using different heads and screw sizes. For alotted screws you will only need four sizes at the 3, 4, 5, 6,5 mm marks. All should have 8-12cm long blades

When it comes to the crossheads it is important to match the head with the driver. There are two main types - Phillips and Pozidriy. Pozidriy now have Supadry but the difference is only cosmetic. If you use screws in your work please make sure that they are Posidriy, as they are much more reliable than Phillips. Two sizes will do for each type and it is best to make the smaller ones nice and small to fit the recessed screws. There are too many names to mention so shop ground. Individual prices below £1 are good value.

Allen keys, which are really hexagonal keys, are also very bandy and come in very reasonably priced sets. It is worthwhile getting both Imperial and Metric.

Small spanners are very useful for tightening up nuts as the use of pliers is not to be encouraged. Again, there is no standard and in fact this time there is a choice of three: Imperial, American and Metric.

The common Imperial sizes are 4 and 58A, 2 and 88A, only occasionally being used. The American sizes are 9; 4 Fe, 16A, 5 F, 16

There are several types of spanner, the most common being the open ended. Nut drivers are handy but pricey, as are ring spanners. However, do not make do with the wrong sizes. As with crosshedd screws you will only damage both tool and component. Some spanner makers are: Bedford, Bahco, Eclipse. Elorg. Footprint, and King Dick, Prices extend over a great range, from 50p to £3 for nut drivers and shifting sponners. Value for money comes at about midrange.

If you are going to expand your construction projects you will undoubtedly need a comprehensive set of tools.

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your score out of 10

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OUESTION I

Find the first prime number greater than 5000 which is the sum of two other prime numbers.

QUESTION 2

Find a prime number such that the sum of the prime number itself and its next two consecutive numbers is also a prime number greater than 5000.

QUESTION 3

Find three prime numbers all different which add up to 500t such that their product is maximised.

@ The winners of our March Brainware problems are Stan Cartwright of Maetoa Place. Gabaifa in Cardiff who was first out of the hat with a correct crossword entry, and Andrew Chandler of Downland Close, Botley, Southampton, who was first out of the hat in the Mind Routines puzzle.

Bottles of champagne are on their way to both.

More bottles can be won for the first two correct entries out of the hat for this month's problems.

Send them to: Computer & Video Games, Durrant House, 8 Herbat Hult, London ECtR SIB. The closing date is 13 May.

ACROSS

- 1. In which to write bridge program (5.8)
- 7. Greature croated from an article on
- party eleven (8). 8. A beginner in the race ends the
- pinball game (4). 10. Souped up pre-
- tender (6). 12. Type of operation requiring lots of
- poetry (4). 14. Abbieviated divinity in the middle of the and
- (2). 16. Space game where tracks are a
- let misplaced (5, 8). 19 Greek cal noise (2).
- 20. Keep the program from the U.S.A. very carefully (4).
- 21 Troy measurement of computur
- direction. Denoted by 19 across (6). 23. Get rid of southern basic refrieve

command (4).

- 24. Astoraid battleground of endless unix pgem (8)
- 27. Program explanation paper at a charge (13).

DOWN

- 1. Truth alternatives as are 3 and 4
- at 12 (7). 2. Paper's speed string storage (9). 3. Record function (3).

- White collar union in nominal note (5)
- 5. Valid centre fiehter (3).
- 6. RND machine man (5).
- 9. Initially the fine printer disc (2). 11. Silicon Valley country (3).
- 12. Software company pols liequently (9).
- 13. Judge side emulation piece (4). 15. Dne on an Island (4).
- 17. Clock on to the first part of this popular game (3).
- 18. Tued program execution feathers (7). 20. Fathom the micro's audio output
- (5).
- 21. Detty code (5).
- 22. Absense not without end (2). 25. Company in new computer begin-
- nings (3). 26. Take a byte? (3).

SUPERMARKET

CARNELL SOFTWARE ZX-81 16K SOFTWARE

ZX-81 16K SOFTWARE

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Yang the property of the Section of the Section Implies
young in a crystal criffic data, within the Validaces Designation
one in a crystal criffic data, within the Validaces Designation
one of the Section of the Section

delicas versen at the clienc game in two degrees of Sculty Testucini include tempoter-dependen word suce grafuel build up of barrging man atc. NEW NEW NEW

Wy on lighthing our accome abvectures at the 3rd Di Microbes. See us there at Certain Melt, Westmanter on 20 April 1 May or search large S.A.L. for left Make Obsessif O payable to R CARNELL ALL DASKES FLUS My FIFTIO CARNELL SOFTWARE 4 STAURTON RD SLIDUGH BERKS SLZ INT

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FTWARE SOFTWARE SOFTWARE SOT

THE APPLE **COMES UP** TRIMPS

GERMAN WHIST

Keeping the kids amused with a computer is easy, but you and up with rather antisocial lods.

This program is the answer. Germen Whist is a lon cord parts, ideal for teaching children the indiments of trick-taking trumps, and all the other things they will need for playing Bridge when they enter

High Society Getting your Apple to do the teaching is probably more fun for the children and more relexing for you. This perticular program is so easy to use end understand that st could also be a neafal introduction to name the computer.

The screen displays your hand of 13 caids, in good graphics, plus an indicator showing trumps, and the top card of the remeining pack

The Apple's hand is not visible. To play a card from your hand you simply turn the game peddies until a leige tlashing inclandle is over the desired card, then

The steederd of play is quite good and the name is fast enough to be interesting The program keeps a running total of names won and lest

All told an amosing little propriett with ont the stress building tension of the usual computer names

Gaimen Whist runs on a 48K Apple nnder DOS 32 or 33, costs £9.95 and is evailable from principal Apple software dealers

BEWARE THE BIRDS!

FALCONS

A squadron of deadly falcons fly in battle formation choice your defence base on a lonely planet

It's no to you to short down the birds of pray before they sweep down and grab you with their razor-sham claws. If you manage to sorvive the birds the game moves onto

the second phase This time the folcons appear on the screen in a diagonal formation, still anddanly sweeping down at you. More at them move out of them to mation to take up alternative attacking positions

The ordinery falcons will sem you 100 noints, but are worth 300 if you blast them.

as they swoop at you Rowers of the falcons which usach your base level. Thay walk along the bottom of

the second into the third phase your life gets really dengerous. The falcons have leid aggs, and these tray bine dots aveds the screen snaking their way towards you, ell the time

because it you don't they grow into hoos pieen creatures canable of the most hornfic destruction. They are worth 200 points When I played it, I was unable to come out of this stage of the geme sive

But if you do menage it the fourth stage bornes a mother ship on to the scies o which can be worth up to 9000 points This is the most herardons phase of all

es the ship opens up a hatch and drops senies of beby falcons on top of you One advantage the player has is a protective shield. This only lasts to tone sec-

ands and will not operate again for another To fire your less: been aress the 0 key on the keyboard, the I key to ectivate the protective sheeld A joystick or the errow

keys are used to move your base ship This is one of the latest offerings from Richmond based SBD Software who specielise in Apple games imported from the States Falcens costs £18 and is to all Apple II with 48K memory



DETWARE SOFTWARE SOFTWARE SOFT

INDERGROUND HAUNT FOR MONSTERS

CATACOMES

Prowling around the Catacombs in search of gold you suddenly come across an avil lanking monster - will you get the gold before the monster outs you?

The aim of Catacombs is to find as much gold as possible before you run out of lood of are caught by one of a venety of crestures it runs on a ZX8t in 16K.

Kays 1 to 8 move you in the direction indicated on the keys - 1 to 4 move you diagonally. Keys 5 to II with shift enable you to tunnel, but bewere, this uses up a lot of your food. As you move a series of rooms and passages will unfold, these may conten food. As you move a sense of rooms and passenes will unlold, these may contern food, gold, monsters or nothing at all

There is always an exit to be found on each level if things get tough The exit takes you to a different level, which provides a breathing space while the ZX sets this up



When meeting a monster you can run sway, but it will follow

An excellent addictive game which will keep you emused for hours. For £4.95 it is cartainly worth edding to your collection but be prepared for a struggle when loadinn - cartainly the most troublesome that I have encountered Catacombs comes from J. K Graya Software

MISSILES MISS

Man the Bunkers! Take coverf It's the lour minute warning! Which is about the length of time one needs to get used to working the controls in this game of Missile Attack

This came is a vary fast machine-code program of the well-known ercade came Missile Command

The object is to protect your cities and missile bases from the peslaupht of countless enemy missiles. This is attempted by finng your own missiles to intercept the enemy rockets prior to them meking a successful etrike Each of your beses to start with has a total of nine missiles

The graphics while fast lesve quite a lot to be desired. The movement of the tracks of missiles across the screen is accompliehed in a weird ave-wranching zig zing fashion which detracts greatly from concentration Also the use of the numeric keyped to control the movements of the Cursor - by using the figures 7, 8, 9, 4, 6, 1, 2 and 3 - Is laborious and time-consuming

Much time - and many games - can be lost rust by giancing down to try to discover which key you have been operating which successfully lost you your lest city and two of your bases

Missiles are faunched by using the keys Z, X and C and once again, valuable time can be lost by glancing down to venify which one is being pushed

MISSILE ATTACK

Maybe the snawer is the introduction of a single joystick control - because it certainly doesn't work well using the keys referred to above

The game itself is similar in all respects to the ercade Missale Command and spart from the "wobbles" and the lack of full control, it plays guits well and fast

The page of instructions is not held on the screen for long enough for the everage resder to essimulate full details of the operating system. This blips up for a grand total of lour seconds and as a consequence of this, it does take a while to work out which keys are supposed to operate which function of the game.

There are no written instructions provided Also the quality of the leaflet that came with the geme is very poor

For the sum of £13.95 it is not good value and I'm rather surprised that the price exceeds the £2 50 I expected On second thoughts I think I'd prafer to continue visiting my local ercade!

On the whole it's a gems which would only maintain a slight interest, you might even play it twice then shove it away and forget about it until you can overcome the cumbersome controls it runs on a Pat, from Softpant, in New Maldan

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INTEGER A number which does not contain a decimal point, i.e. a whole number

A type of game in which INTERACTIVE A word used to describe

ADVENTURE A type of game in which the player has to take e character roli and rathreve a number of treasures or objects by a trail and arror process gwing instructions to the computer. The "hero" (or player) ancounters a wairily of hazards oftan taking the form of dangarous mansfers, wazards and annalis. Some adventure games are so complex that they take weeks, or months, to solve

ALGORITHM A process or set of rules to carry out a task or solve a mathamatical problem.

ARRAY A senes of items (data or information) arranged to form a mean-ingful pattern.

BYTE A term to measure a number of

Bits (Binary digiTS), usually eight bits to a byte CHARACTER STRING A sequence of characters in a row

COMMANO In writing programs this word rafers to an instruction word which specifies an operation which the computer must perform

CONVERSATIONAL SCROLLING Onto displayed on the screen involving stap-by-step communication between the user and the computer OEDICATEO CHIP A chip (micro-

DEDITATED CHIP A CRIP INICIOprocessor) which has been specially programmed to perform a single or special group of applications, a.g. computar games. ROMs are usually the means by which dedicated chips are developed. DISC A meanatic storage device.

OISC A magnetic storage device.

OISC DRIVE A unit which is connected to the computer, used for loading the information storad on discs into the computer.

EUROCARO A type of printed circuit board suited to circuits with a large number of chips.

FLOATING POINT This is a notation used for the calculation of numbers in which the arithmetic point, binary or decimes, is movable but not necessarily the same for each number.

FUNCTION A spacial purposa or

charactanstic action
HIGH RESOLUTION GRAPHICS A
mathod of using Basic commanda to
move a drawing head to any position
on the screen drawing a line between
two specified points.

INTERACTIVE A word used to describe a system which is capable of real time man-machine communications.

JUMP An instruction which causes the next instruction executed to be the one specified by the jump instruction. A jump can be conditioned, where it will branch only if a specified condition occurs. Otherwise, execution will continue to the next instruction following the jump instruction.

LC.O. (Liquid Crystal Oiaplay) A display containing liquid crystals which light up when electricity touchas tham, Used in calculators and watchas LEO. (Light Emitting Oiede) Provides a simple display and consists of an electron tube which lights up when electricity is pessed through it.

LOOP A Basic function rafarring to the repeated execution of a sanas of instructions for a fixed number of times MACHINE CODE. The term used to refer to symbols or numbers assigned to perts of a machine.

MAINFRAME COMPUTER The jargon work used to describe a very large computer

MONOCHROME COMPUTER DISPLAY A display screen used in a computer which shows a picture in one tone or black and white only

NESTEO SUBROUTINE A subroutine which is called within another subroutine NUMBER CRUNCHING The operation

in computing which carnas out the anthmatic and logical processes which information has to go through.

OUTPUT Data which is amitted from a

computer system

PEEK A statement used in Basic which
ellows you to read the contents of a
specified memory address.

POKE. An instruction, used in most versions of Basic allowing you to store integers in a specific place in manary RANDOMISE. A Basic command refaring to the procedure for making numbers, date, or events occur at random RRAI, TIME The is on-the-spot computing when the operation is performed during the time an event is taking when the operation is performed during the time an event is taking on the procedure of the performance of

VARIABLE A symbol whose numeric value can be changed at all times. It is used when writing programs.

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HARD

ONE TOUCH WORDS

The Sinclair is based around a ZBO microprocessor and for your money you will initially receive a startingly small, light, box with a "Goverty" keyboard on rt, a gower pack, leads for a talevision and cassatta recorder and one of the best written Bauc

mannals for baginness to get to gipps with The Sinclair Baser or vary close to that Microsoft vanety but doas without such well-used command words an READ and DATA. It also has that time-caving notion of one-tonich key words which come up on the screen when we when you mad frem.

An example is to touch the "P" on the keyboard after a program line number, then PRINT will appear on the screen, already

spaced for you

Beginners will find this confusing initially
but with usage it becomes automatic.

MEMORY APLENTY

Mamory capacity for the 228f to expanding und protest as coming down Mamortech coming to Mamortech (and the second of the SR AM packs are available. MS Self-war a produced on at £25.0 K fromes as the reddy but peak for £42.95 and a lot for £22.95, it also produces a 2K pack at £15.95 and a 4K book for £22.95.

and a 4K pack for 122-95
Other Imms which offer mamory expaneion packs include Byg Byta of 28, The Spain Patersleid, Hants, 16K for 242-95
And Audio Computars of 87, Bornemouth Park Road, Southend-on Sea, Essex does a 16K for £33, 27K for £46, £4K for £73 and 128K for £23 Sinclain Research's 16K RAM pack casts £49-95

The 2281's membrane keyboard has proved a problem for some users. There are now several typewriter-style keyboards exhabite Faller Merco Systems produce a keyboard which comes residy-built out costs 23.95. The 2081 fits menty most cocess as does the power supply end memory boards with no leads harings boards outside. Dates in om Faller Merco Systems,

The ZK Centre, Sweeting Steet, Livespool DK 'transc slap graducas e keyboard, at 227 95. Raddirch Electronics producas e keyboard in lif farm for £20 50. A keyboard connector is optomal and cests a further £195. D K Computer Keyboards produces e keyboard, al £28 95.

Voice scognition and missis are possible on the 2081 Weldem Stuert Systems produces a sign ach racognition system for the 2081 Weldem Stuert Systems produces a sign ach racognition system for the system, and costs 568 It allows speech imput through a miscophone provided with the system, and costs 568 It allows produces a missis synthiasises which can be used of missis synthiasises which can be used of missis of the system of the sys

In the spring of 1980 home compiting was lifted out of the realms of the expensive hobbyist market and offered to a recently or other.

The Sinclair ZX80 was the reason and it was supercaded the following year by the ZX81 medel. Love or hate these machines, they were restainable in putting computers at the inagertips of the problem at a pince they could afford—and obtaining such hierarchiold items as a TV set and a cassettle recorder.

Among the 81's limitations were a difficult to operate, touch-seasitive keybeard, cuide graphics and it was launched with only 1K of mamery and no printer facilities in still sold 50 000 in the first three months and Sinclain ownership has new usen in 150 000 in the

UK and 250,000 worldwide
The printing and memory deficiencies
were made up towards fine latter and of
last year and many other firms realised
the potential for producing Sincilar
pariphasals and software These marries
and addresses, are find ont below—if
an addresses, are find ont below—if

of sawhere.

The ZX81 mr kit feim costs £49.95 and £69.35 assembled it is built by Sinclair Research of 6 Kings Parade, Cambridge CB2.1SN

Irom William Stnart Systems Ltd, Dower House, Billarmay Road, Herongeta Brentwood, Essex, CM13 3SD

The 50-character-per-second printer developed by Sinciair for the ZX81 allows the main to have hard copy of program listings or of program output, it costs 749.96.

If its useful to have a holder for the ZXSI sand its peripherals, to contain all floss loose wires Various units are available including the ZXSI Workstation, a apacielly-moulden't say from Peter Furiong Products, 125 Catford Hill, Lundon, SE6 APR.

If you prefer a wooden workstation, try ZX Brianess Systems' £15 console The addrese is 14 Brookfield Gerden, Ryde, Isla of Wight

ARE YOU GAME?

There is no shortage of software for the ZXS1 from independent suppliers Many firms have set up producing both

bissness and games for the reschael but the standard of some of these is vary poor. Sincler Research tradit salls four tapes in vary poor sincler Research tradit salls four tapes to fine grams which users have substituted to the first included in the range is a tape containing as games. [Unit, Simper, Meteros, Link, Wolf Pick and Golf Times are a game of the same should be substituted to the same should be substituted to the same should be substituted in amorphism tape. You can have the same small order hors. Cambridge based

Smclarr for £3 95 each

Many of the firms are small one-man outfirts which operate on a mail order basis. Prices for software range from £3 to £10 and the more you pay the batter the quelity tends to be

The main firms microhad in software production are. Bug Byte, 98 100 The Albamy, Did Hall Strast, Livarpool 13 9EP. This firm has about a dozen games on its booke miclading varsona of most of the popular arcade games life asterioids, space invadars as well as an advointire game it also supplies a minit-pripose filing program, a machine code program, and a

drsassemblar/debugging program
Artic Computing 396 James Rackitt
Avenue, Hull HU8 DJA has a tro-of advantue oamas for the ZX81 with ISX

calle girnas rub una Zeef Winn nos. Prammar Publications (2 Kingscota Road, Adduscembe, Croydon, is a gamas supplier offaring a wind rangu of generally good quality. The prices string a term of the control of the co

Silvarsoff, 40 Empress Avanna, lifford, Essex produces gamas for the ZX8f with a starting price of £4.95

Macronics, 26 Spiers Close, Knowla, Solthull, West Midlands Thra firm has mina games on sala which start et £3.95 going up to £9.95 Games miduled aira space inwelfers hirakout and a music pack.

DK 'tronca, 23 Sussax Road, Gorlaston, Geat Yermouth, Norfolk offars cantopada, a version of the racent arcada gama, and e 30 lebyrinth game. Prices start et £3.95. Micro-Gen, 24 Ager Crescent, Bracknell,

Micro-Gen, 24 Ager Crescent, Bracknell, Berkshre, is a small firm supplying a couple of games for the ZX81, including a chass pragram, for £6.50

Himorous games come from Automata, 65A Osbome Road, Portsmouth, Homp shree Advertised es suitable for adults only, the series of thise starts at £3 J. K. Gieye Softwere 16 Paik Streat, Beth. Avon BA1 2TE produce a range of

games with a lot of variety. Lowest price ie £3 95 Psion Computers, 20 Cirton Court, Maida Vela, London NW8 8HT, sells ecrif fantasy

Vels, London NW8 8HT, sells confir fantasy games based on the edventure concept Agem the price is low et £3.85.

Other suppliers are Axis, 71 Brookfield Avenue, Loughborough, Leits; J. D'Cennor.

STennisson Glass, Bolfare-Le Sands, Lancarris, Bardge Solfavia, 38 Femvioon, Marpie Bardge, Stockpart, Desbirre, SKG 58E, Giltroie, P-D Bax, 58, Rugby Warwickshire, CV21 40H, Michael Drwin, 78 Biowerlow Rosel, Willaden, Lendon, NW10 90L, Second Fonndation, 22 Biramber, Beigreve, Tamworth, Staffordshire, 877 21L, Control Technology, 39 Glancaster Ross, Gran-Ulmota's, 37 Swell Invadia, Basidon, Essex.

CORE

JRS Software, 19 Waysids Avenue, Worthing, Sessex, Video Software, Stone Lane, Kinver, Stouebridge, West Midfands and Richard Shepherd Software 22 Green Lave, Mardenhead, Berks.

A USER'S STORY

What's the nate's new of the Z0819 Well! To set up the computee it at moth like any other, larry easy if you said the manual it is when you come to type in a jourgain that the trouble starts. The membrane keyboard is official to gat slong with suppensity or us are used to a regular keyboard. Most people have stalked to beathly desilike it as wall I found the keyword system slow and avolvand to use at first.

If you are new to computing don't bother to use the manual that comes with the unit 1 found it asset to great the basic principles using a book like the ZXRI Basic Book. A lot has been said about loading problems, but 1 have not ancountered very many For the iscord, lose a Ferguson 3115 contable casestite player.

All sorts of haid and software is becoming available for the ZX81 and if must be said that some of if is of dinbions quality Bny software carefully, read the naviews published in this and other magazines

This year will san a militaria of pumphanis for the ZXEI Stracki's own punter has just become available and various bits and pinces ee coming on the market monthly Joysticks, memory packs, sound boards and desk units.

I would recommend thet you roun a group of local users if there is a club in you area. The interchange of ideas is inveloped Another sounce of educe, programs and reviews in the National 2783 Usas Olub For details send en S.A.E. fo 44-46 Eails Cont Road, London VM 85 etc.

The ZX81 represents good value for money Sinclini's product support does leave a folloo be desired especially if you mail order Order lead firms \$10 quite long

WEALTH OF BOOKS A weelth of books are now on sale to help

A weelth of books are now on sale to help you gisen every piece of information about your Sinclair mechine

Many of them cover the same subjects, like programming your ZX81, machine lanquage end the use of subroutnes, but best the lopic in varying ways. We have included a selection with comments

The Explorer's Guide to the ZXB1 by Mike Lord of software house. Timedate, If covers programming edde, liets some gimes, epipications, machine singularies and goes own the bandware ande and expansion It costs EAS from Timedate, of SWat-lowdele, Basildon, Essex, It clema to carry on where the Snichlam manual leaves off And Ion £475, Timedata sells the ZXB1 Maylic Book.

Betting acquainted with your ZXRI by Tim Hartnell, it contains 80 programs for the unexpanded it ZXRI and is available in three editions. Numbers two and their cost £3 95 and £4 95 respectively from the ZXRI uses clinb's magazine Interface by Mail and the address is 44-45 Earls Court Read Lincolne W8 85-J.

And 49 Explosive Games for the ZXB1 by Harthall cests £5.25 and contains listings to program into your, Sinclair.

Stratching Your ZXE1 to its Limits by Travol Shaiplas and Hartnell is available from Computer Publications, Unit 3, 33 Woodthorps Road, Ashford, Middx If costs

Mastering Machine Code On Your ZXIO is by Tony Bakin and it costs £55 So is the Gateway Guide to the ZXII and ZXIO by Mark Chariton for £555 34 Amazing Camax for fail 11 X ZXII 11 X JAISTA GOUST IS PLANT AND A STANDARD TO THE TON T

The ZK81 Basic Book by Robin Norman is from Niewnes Microcomputer Books and this price is £4.55. He has also written a similar book for the older machine called Learning Basic With Your Sincfair ZK80, coshine £4.95.

Pask, Poke, Byte and RAM is about Basic programming and inclindes informe ton on graphics, sattings in the held where, logic, looping and bisanching, charactes manipulation, subrouthors and disbugging II is by Ian Stewart and Robin Jones and costs £455 from Shira Publishing of 4 Chinich Lane, Nantwich, Chrishine CWS

Byteing Deeper into Year 2081 by Mark Hirrson gives programming tips and 37 programs to try out your nawly acquired skills. Signa Technical Press is the publisher at 5 Alton Roed, Wilmslow, Cheshire The price of 55

The ZMI Pecket Book deals with machine code, decimal justification, end playing adventine games as well as giving finits end tops to get the most out of you computer. Phipps Associates et 99 East Sheef, Epsom, Suiney publishes this book by Trevo Toms and sells it for £5 55.

Books from Kume Computers of 11 York Road, Mardenhead, Berkstere ere Understanding Your ZXET ROM by Dr Ian Logan, costing 23 95

The ZX81 Compauses for E5 95 The Siscleir ZX81 Programming fee Real Applications by Flandle Houley at E5 95 Hinsts and Tips for the ZX81 by Andrinov Hewson pneed at E4 25 Mechine Language Made Simpla for E8 95 and Not Daily 30 Programs for the ZX81 at E525 but also 50 Rap Rousing Games for the ZX86/H for E4 95.

Fintilly Mekang the Most of Year XXII Dy Tim Hertranil is obtainable through interface and the following shops: Timedots, 37 Swallbowdale, Besildon, Essax, Foyles Bookshop, Chenng Closs Rood, London WC2; Syntax Software, 95 Collinwood Galdens, Ilford, Essax, The Software House, 146 Oxford Street, London, W1, Mine of Information, 1 Francis Avanne, St Albans, Hertfordshire, Sinclair Research, 6 Kings Parads, Cambridge Cambridgeshire CB2 ISN

GRAPHICS JAIVI

The 2001's quapties capability is very immited in fact three are 20 graphics characters, and an invisia space, to play with Although in this flicks fine graphics the 2021's not viable to programming complex graphes deplays in Stanc II is possible, but it takes up an avoiral but memory and makes animated graphics displays more shoggishly and packly Machine plays more shoggishly and packly Machine sharmater for Basic for the beauting of sharmater for Basic for the beauting of the sharmater of the same of the same sharmater for Basic for the beauting of the same properties.

alternative for Basic for the barginna. There are several add-one for the ZXSI that allow use of programmable and hi-resolution graphics Garcksilva produce a programmable characts agreeator at £26.00 if allows the near to program lower case letters, scennific notation, and space madel-type meaning to prime just a few.

This observation generates comes with a demonstration cassatts of fast mechina code routines. Durksalve also produce a he-isolotion geophist board, at LSS This enables that uses to produce very destailed sossen displays, such as maye and almost parfact area waves, with a high digrea of accuracy District of both their products accuracy District of both their products Brownhail Read, Meybush, Southampton Hent's

DK fromes produces e graphic RDM board et £295 This can be ettached to the 2/36 by thise soldsi connections, it allows the use of lowercase cherecters and esce everety of genes constated graphics characters.

Anyone who has fixed pleving a designity.

game on the ZXB1 keyboard, will relise the value of joysticks. These are evaleble from Micro Gen, Dapf. VG. 24 Agai. Crescent, Bracknell, Barks, et £3.60 each.

Light pens are useful when using meny driven programs. They make the selection of stems on the acreen easier, without heving to use the keyboard to right raples. RO Laboratione; produces the "Doodle" ret £32.50 Details from RD Laborationes, (Dept Y), 5 Kennedy Road, Dane End, Were, Herts SG12 DLU.

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